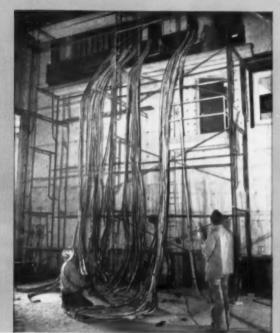
NOVEMBER - 1957

ELECTRICAL CONSTRUCTION AND MAINTENANCE

WITH ELECTRICAL . CONTRACTING



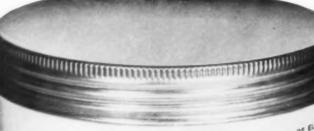
TY CHITER electrical systems include power, lighting, audio and video wiring.

page 78

RESTAURANT ON THE
MOUNTAIN is supplied by
4.16 kv service to ground floor
transformer room.
page 89



Reach For



LARGEST EXCLUSIVE MANUFACTURER OF ELECTRON

10 ROLLS

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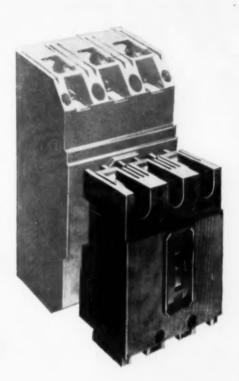
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ACCURATE MANUFACTURING COMPANY Garfield, New Jersey

I-T-E ANNOUNCES NEW 100 amp 480 V "EH" FRAME CIRCUIT BREAKER

Reduces mounting space requirement by 40%





Recognizing industry requirements for an intermediate, compact 100 amp frame 480 v breaker, 1-T-E engineers have designed a new "EH" frame molded case circuit breaker which requires 40% less mounting space than breakers previously employed to meet the rating capacity.

The new "EH" frame breaker is ideal where intermediate voltage and interrupting ratings must be handled, and space is at a premium. Specify the I-T-E "EH" frame and benefit from the compact design advantages which this new circuit breaker provides.

Contact your local I-T-E sales office or write I-T-E Circuit Breaker Company.



SMALL AIR CIRCUIT BREAKER DIVISION

I-T-E CIRCUIT BREAKER COMPANY

ELECTRICAL CONSTRUCTION AND MAINTENANCE . . . NOVEMBER, 1957

APPLETON "AA-51" SERIES VENTED EXPLOSION-PROOF LIGHTING FIXTURES



Close-up showing canopy, extra-safe multiple "AA-51" contact threads, and anti-vibration guard with V-shaped metal prong before engaging canopy notches.

Canopy is securely locked against vibration disturbance by positive engagement of V-shaped metal prong in tightly sealed canopy notch. This anti-vibration guard may be quickly released by hand pressure for maintenance.

Similar in action to canopy guard, this close-up shows anti-vibration guard locking globe ring to dome unit assembly. Metal prong in dome unit is securely engaged by notched globe ring to prevent accidental lossening. This anti-vibration guard also may be quickly released by hand pressure for maintenance.

The fixture with "all" the features now sets even greater standards of efficiency and safety!

APPLETON's new anti-vibration guard on all "AA-51" vented explosion-proof fixtures assures users of positive protection against spark caused mishaps due to vibration conditions. Coupled with multi-thread safety design where a "flametight" contact chamber permits servicing even with the current on, this new anti-vibration guard demonstrates APPLETON's continuing quality research program to bring you the finest in electrical products. Check these other features for proof "AA-51" design leadership and adaptability for your requirements. Write for complete information today.

Sold through franchised wholesalers only



"Full Circle Venting"
Porous metal interior and
specially designed hood
dissipate heat evenly and
safely ... keep fixture temperature down, provide longer
lamp life.

APPLETON ELECTRIC COMPANY 1704 Wellington Avenue, Chicago 13, Illinois



unit, and descend.

Series "AA-SI" stand-by units are ready at an instant's notice for retamping... with handles attached

Only a screwdriver is needed to

change units . . . and only 58 seconds to climb ladder, change











ELECTRICAL CONSTRUCTION AND MAINTENANCE

Published for electrical contractors, industrial electricians, engineers, consultants, inspectors and motor shops. Covering engineering, installation, repair, maintenance and management, in the field of electrical construction and maintenance.

with which is consolidated Electrical Contracting. The Electragist and Electrical Record Established 1901

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Sidelights

BIG MODERNIZATION—Successful large-scale electrical modernization calls for the highest order of design and construction skill. By comparison with some modernization jobs, even the largest new construction project is only a succession of relatively simple details.

New construction can be engineered, estimated and installed with straight forward application of time-tested procedures. No limitation is placed on selection of design concepts; physical equipment can be perfectly related to system objectives and integrated into the building as construction progresses; labor and materials costs can be fairly accurately estimated; electrical installation can be coordinated with work of other trades and work progress schedules can be established in accordance with original design.

In the case of big electrical modernization, however, major phases of design and construction are largely empirical. Work is initiated on only a basic plan. Then details are handled one-by-one, and ultimate design and layout of the system are worked out as the job progresses. Such was the case in the electrical modernization of New York's new Manhattan Hotel, described in the story beginning on page 67.

TV CENTER-NBC's color TV center in Burbank. Calif., reflects considcrable technical thinking of a pioneering nature. This thriving west-coast beehive of activity likewise reflects an accent upon electrical flexibility, provided to accommodate contemplated expansion and changes in this stillgrowing industry. And, since all audio and video wiring was installed by the contractor, in addition to normal power and lighting facilities, this electrical job presents broad overall pictures of both the production and televising fields. Electrical decisions concerned "ideal" lighting and air conditioning levels, location of lighting control booths and desirable types of dimming equipment, effective voltage levels and stabilization means, stability for earthquake-resisting bus ducts and branch circuit flexibility. These and numerous other problems faced by contractors Fischbach and Moore are analyzed by Industrial Editor Hugh Scott in a discussion beginning on page 78,

SILENT SOUND—Oberlander Electric Co., electrical contractors of Peoria, Ill., has a division called Protection Alarms, Inc., which handles a novel business in intruder alarm systems for local commercial establishments. System components cover the

area to be protected with a supersonic tone, far above the range of the human ear, and analyze reflected sounds. The alarm responds to any motion in the area. See page 94.

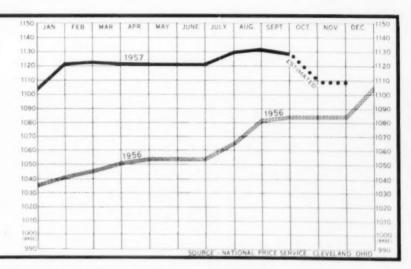
RELAY SWITCHING—More than 100 low voltage remote control switches operate the shop and office lighting system for Carus Chemical Co, in LaSalle, Ill. The system includes a central master control panel, W. J. Martens describes the installation which was made by the Peru Electric Co. in "Lighting Control Flexibility" on page 104.

SOUND LEVELS—The growing use of distribution transformers in commercial and institutional buildings requires special attention to limiting the sound perception of the equipment to a level acceptable to the occupants. All transformers hum. Some of the sound is suppressed in the transformer design or its mounting. Location and arrangement of the space in which the transformer is located can further reduce the sound level.

II, S. Gates of Westinghouse Electric Corporation presents a study of the factors involved and the considerations for application in "Controlling Transformer Sound Levels in Buildings" beginning on page 98.

ELECTRICAL MATERIALS COST INDEX

BASE LINE IS 1000 AND REPRESENTS COSTS OF A TYPICAL ASSORTMENT OF MATERIALS FOR A SELECTED JOB AS OF NOVEMBER 1, 1951. THE INDEX POINTS REPRESENT THE VARIATION OF THESE SAME MATERIAL COSTS AS OF THE FIRST OF EACH MONTH.

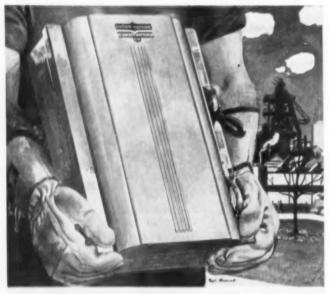


This Safety Switch is Built to Match the Performance of the Finest in Motor Control

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A Safety Switch Worthy of its Name Cutler-Hammer 4105. Type A. 30 to 1200 Amp.

Engineered for "heat-proof" dependability. New design for minimum internal heat generation; new materials for heat immunity.

Automatic pressure fuse receivers; no screws to forget to tighten . . . no screws to loosen in service by alternate expansion and contraction.

Visible blades for quick and sure inspection at all times. New double insulated steel operating hook. Safety is important in safety switches.

Panel mounted mechanism of the Cutler-Hammer 4105 Safety Switch is readily interchangeable with that of the Cutler-Hammer 4101 to permit replacements without case and conduit work. Cutler-Hammer Three-Star Motor Control performance has proved sensational wherever and whenever it has been compared with any other control equipment. A kaolin processing plant in Georgia, for example, reports: "Because of the hard service we give motor control in our plant, we have always had to replace contacts every 30 to 60 days. Our first Three-Star Control has now been in daily use for thirteen months and its original contacts still look and perform like new." A lumber mill in California says: "Control contacts have always been a problem on our drive of the feed chain going to the trim saw. We had to replace contacts every few weeks. Your Three-Star Control is now in its twenty-fourth month of continuous daily operation with the original contacts still in service."

Such control equipment brings important dependability and savings to any job. But it should be matched with a safety switch designed and built to equal the performance. That is exactly what the Cutler-Hammer 4105 Safety Switch offers. It is loaded with advanced design features. See it. Try it. Prove it. Order from nearby Cutler-Hammer Distributor today. CUTLER-HAMMER, Inc., 1306 St. Paul Avenue, Milwaukee 1, Wisconsin. Associate: Canadian Cutler-Hammer, Ltd., Toronto.



Cutler-Hammer Three-Star Motor Control can now be obtained in every needed form



Cuther Hammer Authorized Distributors carry stocks of Three-Star Motor Control it sizes and types of enclosures to meet all the usual industrial needs.



Leading machinery builders equip their machines with Cutler-Hammer Three-Star Motor Control as alandard original equipment, often as components on panels.



The new Cather-Hummer Three Star Unitral procides for the quakess installation or rearrangement of the finest in control equipment, C-H Three-Star Motor Control.

Washington Report

Consumer buying has remained a buoyant factor in the economy during 1957, while many other business indicators have continued to spread uncertainty over the economic outlook. Retail sales in July and August were a record \$17 billion and \$17.7 billion respectively, well above the \$15.9 billion and \$16.1 billion of sales in the same months last year, reports Dept. of Commerce. But higher prices have been partly responsible for the gain, with little more than half attributed to higher physical volume.

Other factors reflect various trends, help to confuse the overall outlook. Generally, there has been a slight upturn during the fall months, which has been spotty and without real vigor. Dept. of Commerce reports late in November and in December will spell out the details, give trends, and provide

a base for forecasting the outlook for the year ahead.

Expenditures for new construction work in September totaled \$4.6 billion, up 1% from August and 4% from September of last year. Privately-financed work totaled \$3.1 billion, up 1% from a year earlier, and publicly-financed work totaled \$1.5 billion, a 12% increase over September 1956. Total outlays for first nine months were \$35.1 billion, 2% more than the similar 1956 period. Privately-financed work declined slightly, while publicly-financed work rose about 10%. The vigor in new construction work has thus been primarily in the realm of public works.

New residential building declined slightly in September, to 88,000 starts, down from the 92,600 starts in August. However, September starts ran only 8% below the same 1956 month, as compared with an average 12% monthly drop from the year-earlier rate, during the first half of this year. Government moves in August to spur home-building, by lowering down payments for FHA-insured homes, at the direction of Congress, have generally not helped residential building, and may have slowed the homebuilding pace, according to National Association of Real Estate Boards spokesmen.

Housewives want more electrical outlets, overhead and built-in lighting, better kitchens, and less installment buying, according to 100 women who met in Washington last month at a Congress for Better Living, sponsored by McCall's magazine. These are only a few of the more important features which they thought should be incorporated in the layout of a home.

Some economic highlights: (While year-end reports will soon be made by Bureau of Labor Statistics and Department of Commerce on most business indicators, the following spot reports may prove helpful to businessmen who are now formulating policies and setting objectives for 1958)

Gross national product will total about \$437 billion for the year.

 Capital spending for new plant and equipment has slowed its pace recently, will probably total \$37.2 billion for 1957—6% above last year's total.

Auto sales are expected to exceed the 6-million mark

 Industrial output for 1957 will probably average 144%-145% of the 1947-49 average. Production in September was at 144%, same as a year earlier.

Total employment in September was 65.7 million, down 150,000 from a
year earlier, and first month to fall short of the year-earlier level for a long
while. The drop was attributed to a decline in farm labor due to bad
weather. Unemployment was reported at 2.6 million, up 300,000 in a year.

Personal income declined slightly in September, to annual rate of \$346.5 billion (about same as in July), and first month this year to show a drop.
 Steel production continues at rate of only about 80% of capacity.



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FROM MINE! The Circle wire and cable you use starts out thousands of miles away high in the Peruvian Andes in South America. There, in Cerro de Pasco's mines, smelters and refineries, such metals as copper, lead, zinc and many others are processed and shipped North . . .

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New Wiring Calculator - FREE!



Send today for this useful wiring aid. Gives conduit sizes, amperage capaci-ties, and motor running data. Write Dept. A-11

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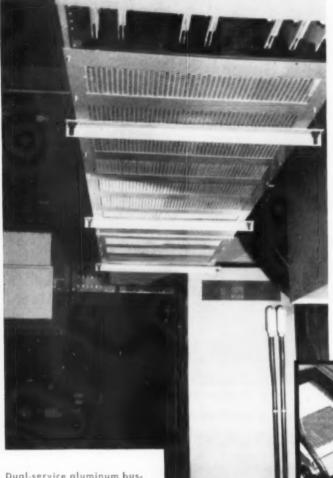


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Air conditioning ups power needs of Empire State Building; Aluminum busways provide low-cost



With increasing frequency, unforeseen air-conditioning loads are making present electrical systems inadequate. The world's tallest building has just solved this problem by installing a 4,000-ampere, 3-phase, 4-conductor, 265/460-volt busway system and a 4,000-amp, 3-phase, 3-conductor, 460-volt busway system using low-cost Alcoa® Aluminum Conductor.

solution

In jobs of this magnitude, aluminum busways provide enormous savings: up to 25% on cost; up to 70% in weight; up to 20% on labor. Compared to cable and conduit, they provide far more flexibility.

When you need a modern, flexible, economical electrical distribution system, specify busways made with Alcoa Aluminum . . . and save. All major manufacturers of busway systems offer units made with low-cost, high-conductance Alcoa Aluminum. Aluminum Company of America, 2302-X Alcoa Building, Pittsburgh 19, Pennsylvania.

Dual-service aluminum busways, each 4,000 amp, connecting utility service with the service switch cubicle.

On the top is the 4,000-amp busway with 800-amp fusible take-offs. Underneath is the 800-amp busway system. All equipment by Metropolitan Electric Manufacturing Company.

Consulting Engineers: The Firm of Edward E. Ashley

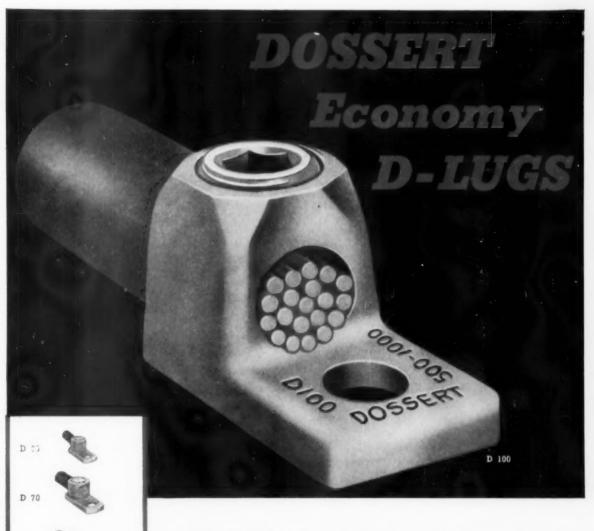
Electrical Contractor: L. K. Comstock & Co., Inc.

Busway Manufacturer: Metropolitan Electric Manufacturing Co.



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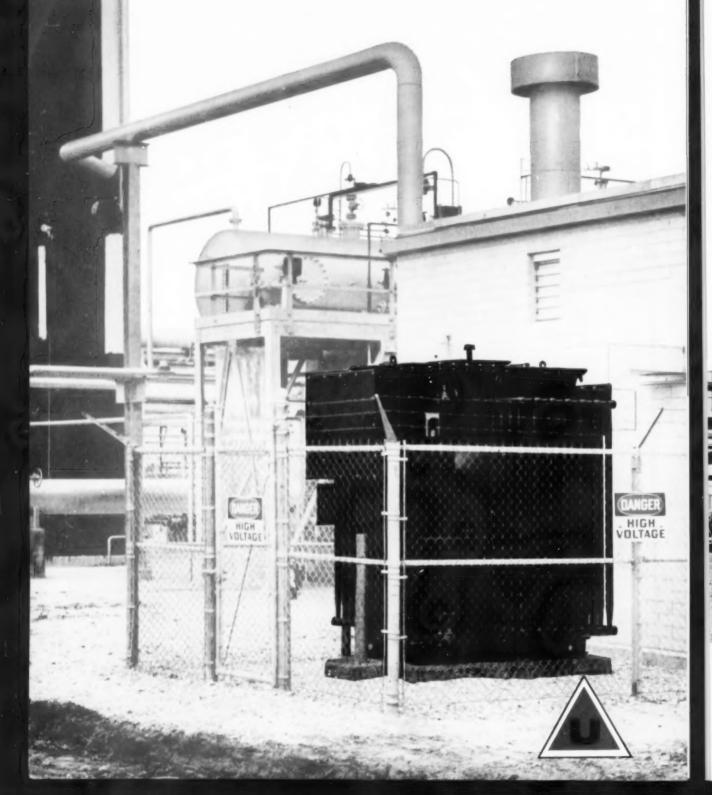




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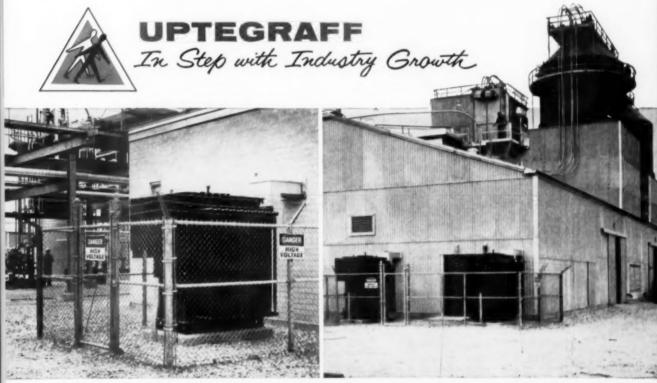
uses UPTEGRAFF load center transformers in expanding plastics division

From Maine to Texas, you'll find Uptegraff transformers being installed in new or expanding industries. In the case of Celanese Corporation, Uptegraff load center transformers provide power for a new plant of the plastics division. Located near Houston, Texas, this plant produces polyethylene.

For more than thirty years, Uptegraff has maintained aggressive leadership in the making of transformers—by constant research and development, new and expanding facilities, and manufacturing know-how. Uptegraff transformers on the job at Celanese is another example of how Uptegraff keeps in step with industry growth. These transformers, located near the center of the load, assure

considerable savings in total cost and improve the power characteristics. Being liquid filled, they provide the maximum in efficiency, insulation strength and overload capacity.

Uptegraff makes a complete line of liquid-filled (oil or askarel) and dry type—(Class B or Class H insulation) load center transformers. Including the latest design features, these transformers insure easy installation, long life and low maintenance. In addition, Uptegraff manufactures Power, Distribution, Instrument and Specialty transformers. Designed and built to more than meet NEMA, AIEE and ASA requirements, they are fully guaranteed. Write for descriptive literature today.



This Uptegraff transformer (above) three-phase, liquid-filled, Type OLC-oil immersed, is rated at 750 kva, 12,500 to 480 volts.

The Uptegraff liquid-filled transformer at the left is rated at 1000 kva, 12,500 to 480 volts—helps supply the power requirements for the new Celanese Plastics Division plant.

These two Uptegraff transformers are each rated at 1000 kva, 12,500 to 480 volts.

Electrical and Engineering Contractor: C. F. Braun & Co.
1000 South Fremont Street
Alhambra, California

R. E. UPTEGRAFF MANUFACTURING CO.

Scottdale, Pennsylvania

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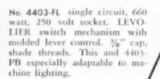
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They are built heavier to last longer with .006" heavier screw shells, double thick molded phenolic casings and the famous LEVOLIER switch mechanism. 660 watt, 250 volt with push button, molded lever or universal pull lever control.

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Convenient a de terminals av id un even who lengths.

conductivity bronze for switch contacts.



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Red plastic button push type mechanism

Upper and lower halves screw together for easy assembly.

Mechanism rigidly Approved by

mp base screw heavier than standard,

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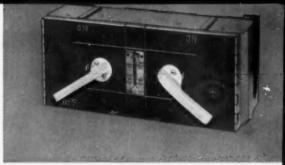
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and ALL are Underwriters Laboratories Inspected

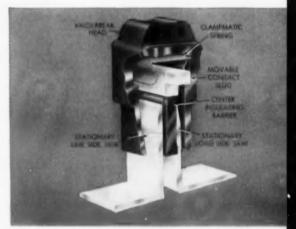
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Standardized switch units are interchangeable, available in a range of ratings. If requirements change, you can substitute units with only a screwdriver and wrench. Horsepower-rated switches have interlocked doors for added safety.



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Vacu-Break power panels minimize maintenance!

A cut in maintenance can bring a big cut in overhead. With a BullDog Vacu-Break® power panel you provide such cost reduction—plus convenient, central control for lighting and motors in a single, compact device. Because the panels are factory assembled, you'll find them far easier to install, too.

See your electrical wholesaler or BullDog field engineer for complete information about these panels and other flexible, electrical products by BullDog. You'll find that a complete BullDog distribution system brings savings all down the line . . . creates an integrated power network that handles today's needs better, provides for future expansion . . . earns good will and repeat business.

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Lighting tennis courts or airports -

Revere offers you the industry's widest line of matched outdoor lighting fixtures

Whether your job calls for two floodlights or fifty mercury luminaires, you can easily plan your installation working from one catalog when you specify Revere fixtures. From the industry's widest line of matched outdoor lighting components you can order with assurance. Assurance that you will find the equipment you need. Assurance that shipments will be planned to coincide with your job schedule.

Look into these—and the many other time and moneysaving advantages of Revere's wide line of matched lighting fixtures. Ask your wholesaler how Revere components can help you with your next outdoor lighting job.



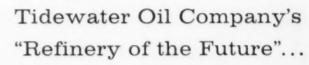
Write for Revere's complete catalog

Revere Electric Mfg. Co., 6009 Broadway, Chicago 40, III., UPtown 8-7100

Available in Canada thru Curtis Lighting Ltd., Leaside, Toronto, Ontario

OUTDOOR LIGHTING: Industrial . Commercial . Service Stations . Streets . Sports . Airports . Shopping Centers







The gigantic new refinery of the Tidewater Oil Company near Delaware City, Delaware, boasts a number of noteworthy features. It is the largest refinery ever built at one time; six of its eleven major processing units are the largest yet constructed; and the amazing capacity of this remarkable installation totals 130,000 barrels-per-day.

One of the important requirements for this advanced refinery was electrical wires and cables of the highest quality. That's why Phelps Dodge bare wire, TW, RH-RW and rubber-neoprene cables, paper-insulated cable and arc welding cables were used.

On every wiring job where top-quality performance, expert workmanship and experienced "know-how" are called for, it pays to rely on Phelps Dodge and your Phelps Dodge distributor!



PHELPS DODGE COPPER PRODUCTS

SALES OFFICES: Atlanta, Birmingham, Ala., Boston, Buffalo, Charlotte, Chicago, Cincinnati, Cleveland, Dallas, Detroit, Fort Wayne, Greensboro, N. C., Mouston, Jacksonville, Kansa City, Ma., Los Angeles, Memphis, Milwaukee, Minneapolis, New Orleans, New York, Philadelphia, Pittsburgh, Portland, Ore., Richmond, Rochester, N. Y., San Francisco, St. Louis, Seattle, Washington, D. C.



Indoors or out--Sola offers the widest line of constant-wattage mercury lamp transformers

Constant-wattage transformers are fast becoming the generally-accepted standard for mercury vapor lighting. Indoors or outdoors, there's a Sola Constant Wattage Mercury Vapor Lamp Transformer available for every popular lamp size used in commercial and industrial applications . . . even two-lamp transformers for operation of H-5 250-watt lamps and H-1 400-watt lamps. Write for Bulletin MV-211 for Indoor Applications; Bulletins MV-219 and MV-244 for Outdoor Applications.

SOLA Mercury Vapor Lamp TRANSFORMERS



Regulating Indoor



Sola Electric Co. 4633 W. 16th St. Chicago 50, III.



NOW, From General Electric . . .

A MAJOR INNOVATION IN SWITCH AND FUSE EQUIPMENT DESIGN

General Electric's new load-break Rollout Switch and Fuse equipment—available in 2.4, 4.8, 7.2, and 13.8 kv and with a high momentary rating—provides maximum safety for your personnel, plant, and equipment.

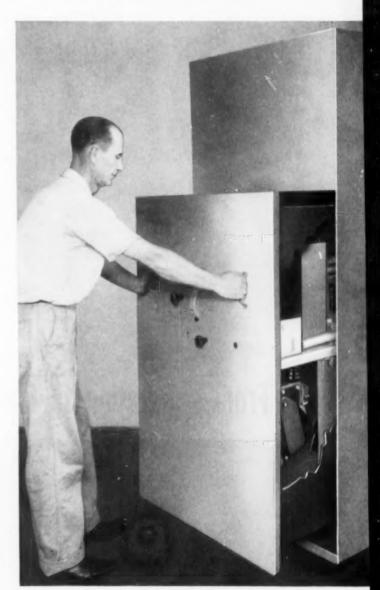
SAFER, **BETTER CLOSING** against full momentary current is provided with the new General Electric equipment by a stored energy closing mechanism.

MAXIMUM SAFETY for inspection and maintenance is provided by the rollout feature of the new General Electric equipment.

MAXIMUM PROTECTION is built into General Electric's equipment through a time delay interlock that prevents immediate re-opening of the switch after closure. This allows time for the fuses to function if the switch has been closed against a fault.

MAXIMUM VERSATILITY is possible with General Electric's Rollout Switch and Fuse because the equipment is available as an indoor or an outdoor unit. Either type can be furnished single, multiple, or in a line-up with metal-clad switchgear.

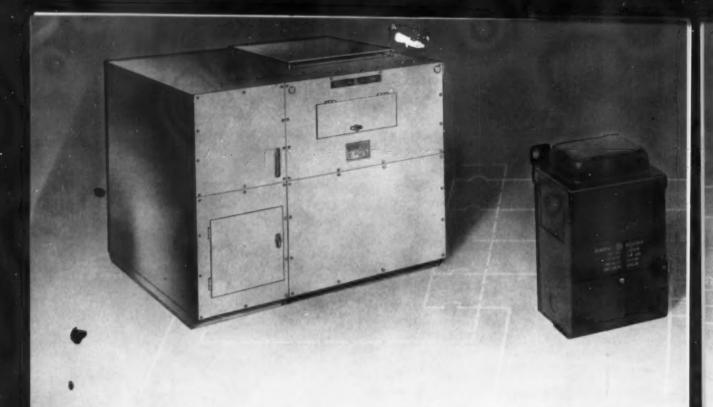
FOR MORE INFORMATION contact your General Electric Apparatus Salesman, or write to Section 511-27, General Electric Company, Schenectady 5, New York.



ROLLOUT FEATURE simplifies maintenance. Insulation is shown cutaway to give position of switch and fuse elements.

Progress Is Our Most Important Product

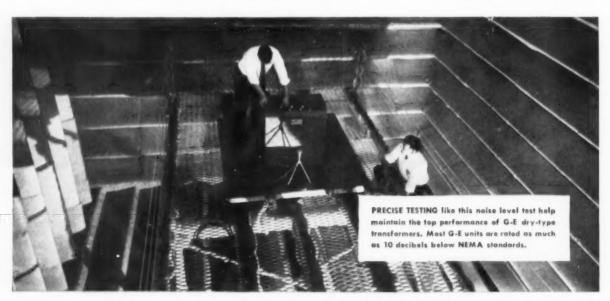
GENERAL 👺 ELECTRIC



INTEGRAL DISTRIBUTION CENTER. A new concept in distribution centers. In one unit you get incoming line, transformer and autgoing feeder. This simplifies ordering and substantially reduces installation time. Besides, this unit is lightweight and compact, measuring only 78 inches high, $37\frac{1}{2}$ to $42\frac{1}{2}$ inches deep and from 48 to 106 inches wide depending on the accessory equipment required. It comes in standard ratings from 75 to 225 kva and from 480 to 15,000 volts, primary.

CONTROL TRANSFORMER. Rating for rating, G-E control transformers are smaller and lighter—up to 40 per cent smaller and lighter than previous models. You save in buying, stocking and installation with G-E control transformers. A complete line is available for 50/60-cycle and series multiple operation. They come with open wiring in ratings 25 to 250 volt-amperes and with wiring compartments in ratings from 25 to 2000 volt-amperes.

From substation to load—cut costs, increase





TYPE M TRANSFORMERS. Compact, quiet and easy to install. You can mount this unit on its side . . . on the wall or floor . . . upright . . . on its back . . . on the ceiling. General Electric Type M transformers come in 3-phase ratings up to 150 kva and are designed specifically for applications requiring low noise level—45 decibels or below. Single-phase Type M transformers are now available in ratings up to 50 kva. And you get quick delivery, too.

MERCURY LAMP TRANSFORMERS. For your mercury lamp installation you want a dependable transformer with high power factor and low starting current. You get both plus low initial cost with General Electric mercury lamp transformers. Speedy installation is another big advantage. Just slip the nameplate aside and you have access to a spacious wiring compartment. Installation and maintenance are fast and simple because complete easy-to-read wiring instructions and diagrams are right where they are needed.

efficiency with G-E dry-type transformers

Only General Electric offers a complete line of dry-type transformers for distribution, stabilization, control, and utilization of power as you need it and where you need it!

Here is the way to simplify your transformer specifying, ordering and installation problems. Because you can get *the* drytype transformer you *need* for most applications from your General Electric distributor, you save time and money, and get prompt delivery of popular models.

FIVE BASIC TYPES of quieter, smaller, lighter-than-ever dry-type transformers are available from General Electric:

integral distribution centers, and Type M, control, mercury lamp, and voltage stabilizing transformers. And . . .

GENERAL ELECTRIC ENGINEERS will be happy to give you help on your system needs—just call your nearby G-E Apparatus Sales Office. For more detailed product information, write Section 410-48 and ask for Bulletins GEA-6619, GED-2767, and GEC-1440. G.E. Co., Schenectady 5, N.Y.

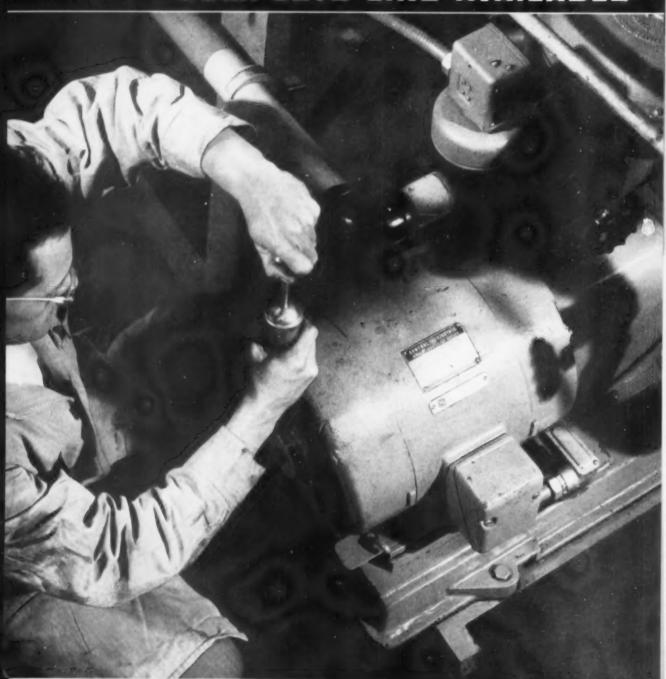


compact...power-packed

New General Electric

NOW EASIER

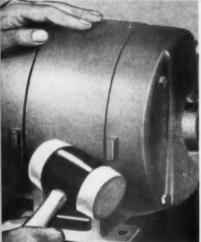
COMPLETE LINE AVAILABLE



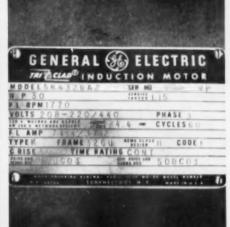
TRISS CLAD Motors are...

TO MAINTAIN

THROUGH 125-HORSEPOWER



FAST END-SHIELD REMOVAL is possible because of Tri-Clad '55' motor's rugged knockoff lugs. Remove four bolts, tap on knockoff lugs and end-shield is off to permit easy repositioning or quick motor inspection.



EASIER TO MAINTAIN, Tri-Clad '55' motors utilize a stainless-steel, non-corrosive nameplate to give complete rating information including AFMBA bearing numbers. Separate steel plate gives connection diagrams.



EASIER TO INSTALL, Tri-Clad '55' motors use Perma-numbered leads to simplify wiring, speed motor hook-up. Numbers are stamped on terminals and printed on every half-inch of Geograe IV leads.

immediate shipment . . . all ratings

The need for faster production schedules and reduced production costs has made motor maintenance of prime concern to motor users. Modern motors must be easy to inspect and maintain without loss of production time due to routine maintenance.

TO MEET THIS NEED, G-E Tri-Clad '55' motors feature an oversize grease reservoir which contains enough grease for normal 5-year operation. Yet, new grease can be added while the motor is running. Other easy maintenance features are described above.

EASE OF MAINTENANCE, however, is not the whole Tri-Clad '55' motor story. Experienced G-E motor engineers have used revolutionary materials and the most modern production and testing facilities to provide a motor that is not only easier to maintain, but also more reliable and easier to install.

Formerly available only to 30-hp, these proven Tri-Clad '55' motors are now available for immediate shipment—usually from nearby warehouse stocks—up through 125-hp.

FOR FULL INFORMATION on the complete Tri-Clad '55' motor line contact your nearest G-E Apparatus Sales Office or Distributor.

Section F891-7 GENERAL ELECTRIC COMPANY Schenoctady 5, New York

Please send me the following publications:

- FREE BULLETIN (GEA-6602) describes advanced features of new Tri-Ciad '55' motors through 125-hp.
- FREE SLIDE RULE (GEN-148) to determine weight and space-saving benefits of new Tri-Clad '55' motors.

NAME

TITLE

COMPANY

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CITY & STATE

Progress Is Our Most Important Product

GENERAL & ELECTRIC



SAVINGS OF \$90,000 were obtained using G-E 480Y/277-volt systems in Exchange Bank, Braniff Building in background.

General Electric system-engineered equipment



PLANNING: W. Marshall, J. Glendinning, G-E; consultants J. M. Guerrero, E.B. Gamble; G.M. Bostock, Park V.P.

COMPACT G-E Type DA7093 motor control center takes power from feeders to control all motors safely.



HIGH VOLTAGE LIGHTING at 277 volts creates savings by combining light, power source. Modular design permits flexibility.

1500 KVA double-ended load center unit substation is typical of the units that will supply power in Exchange Park buildings.



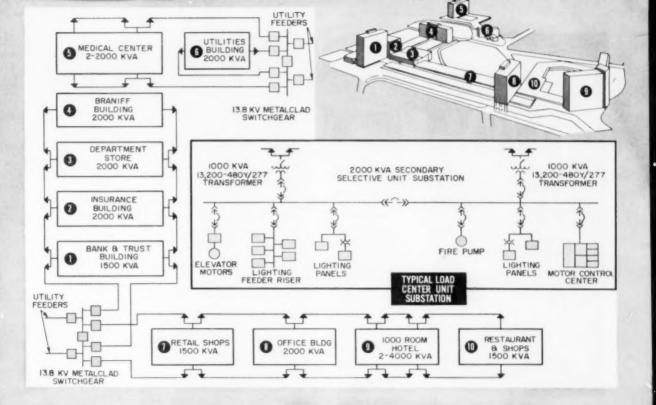
ECONOMICAL power distribution is provided by feeder busway. 30 kva, 110-V transformer serves office equipment.

PROJECT POWER is from two line-ups of G-E 13.8 kv metalclad switchgear. Unit shown is located in Bank basement.









FLEXIBLE, ECONOMICAL POWER distribution system for entire Park Project is contained in one-line diagram. Numbers

key equipment to Project buildings. Completed Utility Building also uses General Electric 480Y/277-volt equipment.

serves power needs of "city within a city"

\$125 million Exchange Park Project in Dallas shows how General Electric's "system approach" is key to flexible, economical commercial power distribution.

To keep pace with the Southwest's vigorous economic growth, a \$125 million commercial center is rising on 120 acres four miles from downtown Dallas. Known as Exchange Park, this community represents one of the most advanced city-within-a-city developments yet attempted in the United States. It is scheduled for 1960 completion. Nine major buildings, parking for 15,000 cars, 40-foot-wide air conditioned malls, 150 retail shops, and other facilities will enable shoppers to take care of every personal and business need in scientific comfort. Already completed: Exchange Bank and Utility Building.

SELECTING THE BEST POWER DISTRIBUTION SYSTEM, to satisfy Exchange Park's heavy load concentration efficiently and economically, required thorough system analysis early in project planning. G-E engineers, working closely with Mr. George M. Bostock, Vice-president and Engineering Manager of Exchange Park and his consultants*, recommended a 480Y/277-volt

secondary selective system as optimum. General Electric also provided basic system layout, service engineering and installation assistance at the site.

ADDED VALUES stem from adoption of G-E system recommendations. Exchange Park's 13.2 kv distribution system has capacity for load growth. Secondary selective system features permit reliable operation. Utilization of 480Y/277-volt system means fewer, less-metal circuits and substantial dollar savings. Using 480Y/277-volt equipment in only two of nine buildings, for example, saved \$90,000.

GENERAL ELECTRIC SYSTEM ENGINEERING CAN HELP YOU on your construction project. Call on G-E engineers early in your planning when they can be of greatest value. Contact your nearest G-E Apparatus Sales Office or write General Electric Co., Section 680-12, Schenectady 5, N. Y.

*Architect: Lane, Gamble and Associates Consultants: Blum and Guerrero Electrical Contractors: Fischbach and Maore, Superior Electric Co.

Engineered Electrical Systems for Commercial Buildings







Connector



T.NO.BM



Cutter for 1/2, 3/4 and 1" E.M.T.



"BM" # 1000 Holder for ½, ¾ and 1" E.M.T.

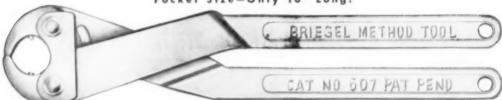


"BM" #600 Changeable Jaw Indenter



THE NEW BM607 INDENTER FOR 1/2" FITTINGS

Pocket Size-Only 10" Long!



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All B-M Indenter Fittings are U.L. Approved as concrete-tight and all Compression Fittings as raintight as well as for general use (File Card £10863). Also comply With Federal Specifications W-F-406.

METHOD

GALVA, . ILLINOIS



introducing the TSA-47 GENERAL ELECTRIC'S

All-new Time Switch

Designed, built, and tested to handle your regular-duty, indoor time-controlled jobs. Provides greater reliability and long-life operation at low cost. Available with double-pole or single-pole contacts.

General Electric's versatile new TSA-47 is a topquality time switch at ordinary time switch price. Packed with years-ahead features, the TSA-47 will provide the reliable control you need, too . . . day after day, year after year . . . for a wide variety of timing jobs.

HERE ARE SOME MORE REASONS WHY YOU'LL LIKE SWITCHING TO GENERAL ELECTRIC'S NEW TSA-47:

- FASTER INSTALLATION is made possible by easily accessible terminal board with "dead front" protective cover. Plenty of knockouts plus removable cover permit any-position mounting in corners or close to other equipment. You can snap entire internal mechanism out in seconds to make mounting easier.
- EXTRA PROTECTION is built in at no extra cost. Both double- and single-pole contacts are rated at 35 amps, 240 volts per pole under tungsten. The new TSA-47 will withstand 350 amps of inrush current. Wide temperature range extends from -20 F up to +150 F.
- EXCLUSIVELY DESIGNED OMITTING DEVICE can be put in or taken out quickly and easily right in the field.

- 12 ON-OFF OPERATIONS in a single day are possible. You can set your time cycles as close as one hour apart,
- FOR OUTDOOR APPLICATIONS, internal mechanism is available for the first time in a truly rain-tight case at new low cost (Type TSA-41).

General Electric also offers the rugged TSA-40 for your heavy-duty timing jobs either indoor or outdoor.

For more information about General Electric's complete line of top-quality time switches, contact your nearby Authorized General Electric Time Switch Distributor. Or, write for your free copy of bulletin GEA-6681, General Electric Company, Section 584-14, Schenectady 5, New York.

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GENERAL 👺 ELECTRIC



"GENERAL ELECTRIC REMOTE-CONTROL WIRING COSTS ME LESS TO INSTALL THAN ANY OTHER LOW-VOLTAGE CONTROL SYSTEM!"

... Mr. Victor J. Previti, Electrical Contractor, Dundalk, Maryland

"I've used the others and know the difference," says Mr. Previti. "I think G-E remote-control wiring is the lowest cost low-voltage control system today. On most jobs I offer it for only about \$4 more per room than conventional wiring. And my men install it as easily as conventional wiring.

'G-E remote-control helps me get more jobs, too, because builders can see it's a house-selling feature . . . makes wiring a real brand-nameconvenience they can brag about. They get 50% more switching points, plus the nine-position G-E master selector switch that's always a big hit with prospects.

"Just look at the Havenwood job." (photo below) "I was awarded a good size contract because I was able to offer the G-E system at low extra cost . . . only a small amount more per house. Of course that's compared with a high-quality conventional job that would give the builders about the same amount of three-way and four-way switching convenience they wanted. The point is, I got the job . . . by selling them a real 'extra' ... without much extra cost."

Ask your General Electric distributor to show how you can profit by installing G-E remote-control wiring systems. OR: Write for further information to General Electric

Company, Wiring Device Department, Providence 7, Rhode Island.

(Below) Partners H. E. Suhr, Jr., and Martin W. Seabolt of the Ashton Building Corporation stand in their Havenwood development, Baltimore County, Md. Leaving the trees and using name-brand, high-quality materials such as G-E Remote-Control Wiring helped us set a local sales record," say the two builders. "We built and sold 130 homes in the \$13,400-and-up price range here in less than two years. than two years ... off the plans, without a model home ... and without advertising!"



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GENERAL 88





Specify the NEW GUTH FUTURLITER it puts you "light years" ahead!



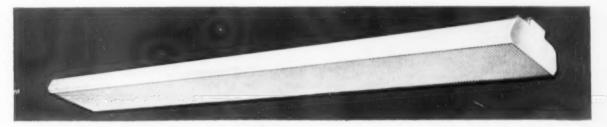
Back in a new functional dress, Guth Futurliter breaks through the time barrier of illumination planning. You meet today's lighting requirements and anticipate tomorrow's needs, with Futurliter's "flexible footcandle package."

> Install two rows now . . . add a third lamp later, in the same fixture. Still later, you can add more Futurliters between units installed now . . . or complete third and fourth rows!

Whatever footcandle flexibility you want—Futurliter delivers.

IMPROVED LOUVERING AND DIFFUSING MEDIA AVAILABLE
... with famous GrateLite Louver Diffuser*, cross baffles,
glass bottoms, and others.

Choice of 4' and 8' lengths available for 100% downlighting, or combination up-and-down lighting, for pendant or close-ceiling mountings. Write for complete data.



THE EDWIN F.

COMPANY . ST. LOUIS 3, MO.

U. S. Pat. No. 2,745,001 Can. Pat. 1957, No. 538,245



THERE IS A DIFFERENCE IN

G-E White rigid conduit is manufactured for easier

When you look through a length of G-E WHITE you'll see that its interior surface is uniformly smooth all around, from end to end. This smoothness is one of the qualities that makes G-E White rigid conduit different — a conduit quality that gives you easier fishing and wire pulling ...helps you make speedier installations.

At General Electric, special manufacturing and quality control procedures are responsible for the smooth interior. "Pickling" in acid removes scale and impurities from the untreated conduit. The interior coating is applied evenly throughout the entire length, forming a continuous

barrier against corrosion. This coating is specially formulated to provide a low-friction, corrosion-resistant interior that cuts down wire-pulling effort.

EASY BENDING IS ANOTHER DIFFERENCE

G-E WHITE bends without kinking or flattening, and threads easily, too. That's because General Electric bonds the exterior zinc coating to the rigid conduit by metallizing, a process that eliminates the excessive heat, and the subsequent quenching and straightening which tend to work-harden ordinary conduit.

Your General Electric distributor stocks



EVERY LENGTH OF G-E WHITE is carefully checked for Interior cleanliness and uniform smoothness. This strict quality control gives you easy fishing and wire-pulling through every length.



"PICKLING" IN SULFURIC ACID removes all the brittle scale and any impurities from the reamed and threaded conduit. The result is a chemically clean interior and exterior.



SPRAYING THE CONDUIT INTERIOR with a specially formulated Glyptal⁶ coating provides a pliable finish that won't chip or crack even during bending. This low friction coating helps make wire-pulling an easier job.

CONDUIT

fishing and wire-pulling

an ample supply of G-E WHITE to meet your requirements. Ask him for detailed information or write for literature to Section C72-1118, Construction Materials Division, General Electric Company, Bridgeport 2, Connecticut.

*Registered Trade-mark General Electric Company



LABORATORY PULL TESTER proves that G-E WHITE offers 14% easier wire-pulling than ordinary conduit. Here, an inspector tests a ½"-diameter, 3-ft length with two 90-degree bends, for continuous pull.

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MANUFACTURING PLANTS: *Birmingham, Ala.; Anaheim, Calif.: Jonesbore, Ind.; Marion, Ind.; Tiffin, Ohio Warehouses* and Sales Offices

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*Detroit, Michigan Hartford, Connecticul Indianapolis, Indiana *Kansas City, Missouri *Los Angeles, California

°los Angeles, California °Newark, New Jersey Omaha, Nebraska *Portland, Oregon Upper Darby (Philadelphia,) Pa. Phoenix, Arizona Rochester, New York

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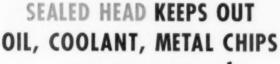






802TC Side Push Rod Type

802TF Rod Type



...your guarantee of reliable limit switch operation!

With completely sealed operating heads, as well as sealed switch bodies, Allen-Bradley Bulletin 802T oiltight limit switches provide maximum reliability in limit switch operation for your modern, high speed production machines. The sealed head excludes oil, dirt, and metal chips from the operating mechanism... the spring return, momentary contact operators cannot become sluggish and stick.

The maintenance free, double break, silver alloy contacts are sealed in the oiltight body. Interchangeable operating heads are available with various push rods and levers which can be mounted in any one of four positions. Oiltight transparent plastic covers, for inspecting wiring without removing the cover, are available for most units.

Here's a line of quality limit switches in which each type will provide millions of trouble free operations. Have your A-B control engineer acquaint you with this latest development—another advance in limit switch design.



802TA Roller Lever Type



802TB Top Push Red Type with Plastic Window



802TAO Roller Lever Type for Cavity Mounting



802TG Adjustable Roller Lever Type

ALLEN-BRADLEY

NOW ... ALLEN-BRADLEY

PRECISION-TYPE LIMIT SWITCHES

ARE ALSO OILTIGHT!



OILTIGHT HEAD

Newly designed head on push type seals out oil. Roller lever types have sealed operating shafts.

OILTIGHT BODY

Synthetic rubber gasket between housing and plate excludes oil and coolant from operating mechanism.

Allen-Bradley precision-type limit switches combine very close operating tolerances with such a sturdy construction that they can be used for any industrial application. Now this line of limit switches has been further improved by making them completely oiltight.

Especially designed for use where the motion to operate the limit switch is measured in thousandths of an inch, these Allen-Bradley limit switches can henceforth be employed in applications where oils, coolants, and dust are present.

Allen-Bradley Bulletin 802 oiltight precision limit switches have a positive snap action mechanism which prevents any possibility of a "dead center"
... no matter how slowly the actuating force is applied.
They are available in both the spring return and maintained contact construction. And all have maintenance free, silver

alloy contacts.

Specify these Allen-Bradley oiltight limit switches where "precision" operation is required and where dirt and oil could cause trouble.



Push red type. Plastic cover, for inspection without removing cover, made for most units.



Roller lever type limit switch with lever on right side. Also available with lever on left side.



Roller lever procision-type limit switch with roller lever in front of the switch body.





Bulletin 801 general purpose limit switches in standard or heavy duty ratings. Maintained or momentary contacts with siew or snap action. Silver alloy contacts used throughout this line.





On new tract site, Mr. Byrnes (left) discusses telephone service with Mr. Charles Wirtle of Cincinnati and Suburban Bell Telephone Company

"Concealed telephone wiring helps me stay on top of the market"

- says Mr. Chas. F. Byrnes, Builder, of Cincinnati, Ohio

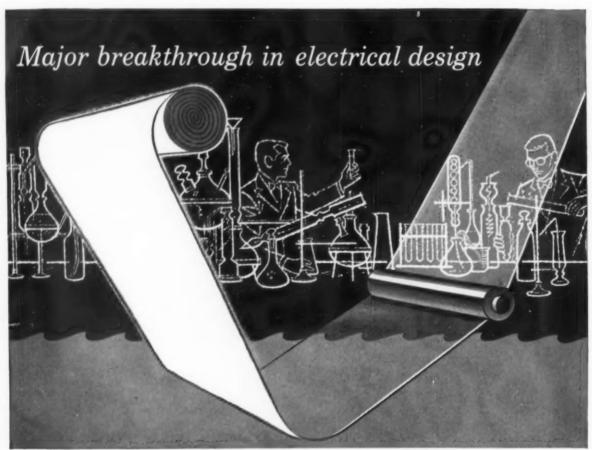
"I believe in getting the newest features into my homes," says Mr. Byrnes. "One of those features is concealed telephone wiring. It helps me stay on top of the market.

"Telephone outlets are a definite sales point. They're one of the first things we emphasize when talking with customers. Also, we mention concealed wiring and multiple outlets in our advertising, because we know they're conveniences that people are looking for. I wouldn't think of building a house today that didn't have telephone facilities built into it."

Your nearest Bell Telephone business office will help you with concealed wiring plans. For details on home telephone wiring, see Sweet's Light Construction File, 3i/Be. For commercial installations, Sweet's Architectural File, 32a/Be,

Working together to bring people together BELL TELEPHONE SYSTEM





 ${\it Johns-Manville's\ new\ Type\ 71\ Quinterra\ insulation\ combines\ the\ lasting\ dielectric\ strength\ of\ the\ purified\ asbestos\ base\ sheet\ and\ epoxy\ varnish.}$

For smaller Class B equipment...

New J-M Type 71 Quinterra® Epoxy-treated to double dielectric strength

Johns-Manville now opens up a new era in electrical design, with Type 71 Quinterra—the epoxy and asbestos insulation that breaks through today's limitations on ratings and size—offers untold new possibilities in compact class B equipment.

Offers 5 major improvements

1. High Epoxy Content (approx. 45% to 50%) provides the optimum electrical benefits of these high-dielectric resins and asbestos. This mechanically and electrically strong insulation combines the lasting inherent dielectric strength of the Quinterra base sheet with the excellent electrical properties of epoxy varnish.

2. Over 700 Volts/Mil is the tested and proved dielectric strength of Johns-Manville's new Type 71 Quinterra insulation. This exceptionally high characteristic offers brand-new opportunities in increased power from smaller frames—with less metal.

3. Continuous Operation to 175C with no reduction of properties brings Quinterra Type 71 well above the standard class B limit of 130C. At 175C, this new insulation exhibits a dielectric strength well above its 700 volt per mil minimum.

 Moisture Absorption Less than 2%. Quinterra Type 71 resists humidity conditions that would break down other insulations. Even at high relative humidities, this new insulation exhibits unusually high dielectric strength!

5. Improved handling characteristics make Type 71 Quinterra ideal for today's assembly techniques. Its flexibility lets it adapt to the reduced radii of smaller equipment.

Also new Type 72 Quinterra for less rigid requirements

Type 72 Quinterra (approx. 20%-30% epoxy content) offers high dielectric strength at considerable savings.

FOR a complete specification sheet and samples of the new epoxy-treated Quinterra, write Johns-Manville, Box 14, New York 16, N.Y. In Canada, Port Credit, Ontario.



Johns-Manville ELECTRICAL INSULATIONS

GEDNEY'S RIGHT THERE IN YOUR CORNER

helping save time ... hold down costs

CORNER FITTINGS? Well, here are three that have proved immensely popular for the simple reason they're easiest to install—save time and labor that really counts up. Like the

rest of the full Gedney line they're made of unbreakable malleable iron...accurately machined and threaded...individually inspected. Order Gedney—always—for lowest installed costs!



90° CORNER ELLS

Fitted with gasketed cover. Both ends female. Made of malleable iron, cadmium plated. Available in a full range of sizes from 1/2" to 2".

90° CORNER ADAPTERS

Fitted with gasketed cover. One end male, one end female. Made of malleable iron, cadmium plated. Your choice of sizes from ½" to 2".



CORNER PULL-IN CONDUIT ELLS

Today's top specification for space-saving, machine wiring, easy wire pulling. Malleable iron, cadmium plated. Sizes run from $\frac{1}{2}$ " to $\frac{2}{2}$ ".





GEDNEY ELECTRIC COMPANY



RKO BLDG. • RADIO CITY • NEW YORK 29
Foundry, Factory and Shipping Point: Terryville, Conn.

FA

Frank Adam Equipment is as

That fact, according to John T. McCharen of Osborne Electric Company, electrical contractors of Oklahoma City, is one of the big reasons why Frank Adam Equipment was selected for installation in the First Christian Church of Oklahoma City, more popularly known as the Church of Tomorrow.

"The designers of the Church of tomorrow," Mr. McCharen said, "wanted an electrical distribution system that was modern in design, expertly engineered, and would give long-lasting and trouble free service—equipment that would blend with the general design of the Church.

"And that is exactly what they got when they installed Frank Adam Equipment for the control and distribution of power and light.

"Frank Adam Equipment is as modern

as tomorrow – safe and dependable. It not only provides adequately for today's electrical needs, but it anticipates future demands and allows for it.

"That we think, is extremely important. It means that the user will not be confronted with the problem of making extensive changes in his electrical system to provide for increased power demands. With Frank Adam Equipment changes in capacities, additions of new circuits and new equipment is simple and easy. That's why we like Frank Adam Equipment.

Mr. McCharen is absolutely right. Frank Adam Equipment is built with an eye to the future. Assure your customers adequate capacity for today and tomorrow. Recommend Frank Adam products.

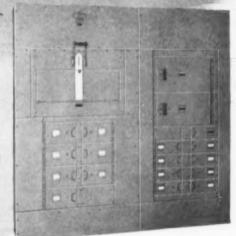
modern as TOMORROW!

First Christian Church of
Oklahoma City, more popularly
known as the Church of Tomorrow.
R. Duane Conner, Architect.
Osborne Electric Company,
Electrical Contractors.

Hi-efficiency feeder distribution type busduct



Klampswitchfuz distribution switch board



FRANK ADAM

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makers of

busduct · panelboards · switchboards · service equipment safety switches · load centers · Quikheler



CLARK distributors are the only distributors carrying the outstanding "CY" motor starters

The Clark Type "CY" line of AC motor starters offers many advantages to electrical contractors who consider customer satisfaction an important business asset. Rugged mill-type construction, twin-break contacts, vertical lift magnet, enclosed arc shield—all contribute to more dependable, trouble-free performance and longer life. Sizes 2 and larger feature the exclusive "CY" principle of arc-quenching, which combines twin-break contacts with magnetic blowouts forcing the arc to rotate and move constantly over contact surfaces. This practically eliminates metal build-up and pitting, and greatly increases contact life.

In addition, CLARK Type "CY" starters have many other features appealing specifically to contractors and maintenance men. Installation is faster and easier since all wiring can be done from the front. Contacts can be inspected without tools. Movable and stationary contacts can be removed and replaced quickly, coils changed, and the entire magnet assembly removed—all from the front—without special tools, and without removing starter from cabinet or panel.

With the Clark Line you have a Control Specialist at your service



Always available for help in selecting and applying the proper controls, CLARK factory-trained field men not only give you the benefit of their own "know-how", but can call on specialized experts in our home office for unusually complex jobs.

A FEW OF THE MANY OTHER OUTSTANDING PRODUCTS IN THE CLARK LINE



For more information contact your Clark distributor or one of the Clark sales offices located in principal cities throughout the country.

The CLARK



1146 East 152nd Street

• Cleveland 10, Ohio

Everything Under Control

IN CANADA: CANADIAN CONTROLLERS, LIMITED . MAIN OFFICES AND PLANT, TORONTO

ELECTRICAL CONSTRUCTION AND MAINTENANCE . . . NOVEMBER, 1957



A few wraps of Gold Seal Rubber Tape provide a continuous sheath with insulating properties to match the dielectric strength of the original wire covering. A quality tape of lasting "tack" and fusion, Gold Seal molds easily

to a perfect insulating splice, gives complete electrical and physical protection. Made by Jenkins Bros.,

Rubber Division, 100 Park Avenue, New York 17.



In 10-roll containers or single rolls.

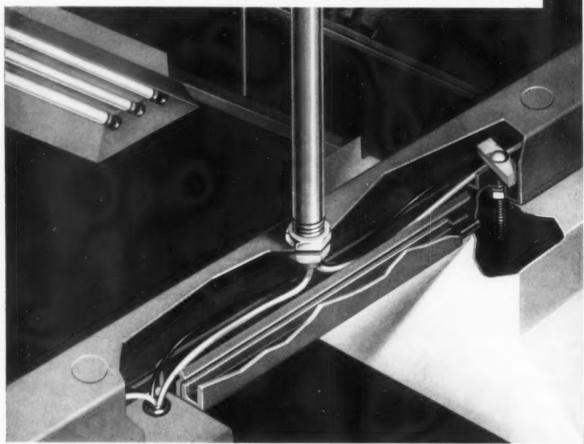
sealed in cellophane, stays fresh.

FOR EVERY APPLICATION

Gold Seal FRICTION . RUBBER . PLASTIC Topes ... Commercial and Specification Grades

ELECTRICAL CONSTRUCTION AND MAINTENANCE . . . NOVEMBER, 1957

NOW: NEW WIDER SLOT CHANNELS FOR ELECTRICAL INSTALLATIONS



Install Fluorescent Fixtures — Without Special Tools



Now for your convenience—new channel, #7121 and #8121, above, have wider 1/4" slot for easy access. Standard channel, #5121 and #6161, below, have 1/5" slot.



Mult-A-Frame It!

Introducing: in addition to the four existing channels you have been using, two new MULT-A-FRAME channels, designed to speed electrical installations. Convenient wider slot now allows easy access.

Two new MULT-A-FRAME channels, both of 12 gage steel, are available: No. 7121 channel and No. 8121 channel. These new channels are ideal for fluorescent fixture support and for other electrical installations. Dimensions are: No. 7121–15% square with 34" slot; No. 8121–15% wide by 1" deep with 34" slot.

Only tools needed to MULT-A-FRAME are a saw and pair of ordinary pliers. You get safe and sturdy fixture suspension while keeping on-the-job labor costs rock-bottom.

For complete information on the cost-less features of MULT-A-FRAME, send for your free copy of the new MULT-A-FRAME catalog—or, if you prefer, contact your local distributor direct.



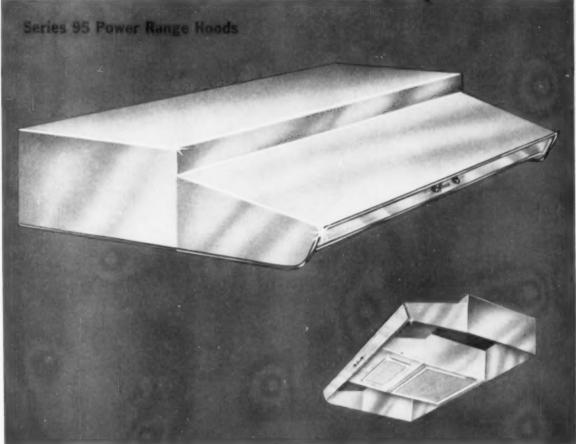
MULT-A-FRAME DIVISION

Ainsworth Manufacturing Corporation-1471 E. Atwater Street, Detroit 7, Mich.

Make sure you have the New

Slim Trim





FASCO'S FIRST with the smart new look in power range hoods to fit today's trim modern trend in kitchens . . . crisp, sharp styling featuring a sparkling gold instrument panel gives this hood the wanted look of tomorrow.

Featuring built-in light, easy to clean filter, and quiet, powerful ventilating fan, this new Fasco power range hood is the perfect finishing touch to any kitchen.

Lustrous copper, sparkling stainless steel or gleaming white finish fits any kitchen decorative scheme. Matching splash plates also available.

For full information on this and other Fasco power range hoods and Fasco ventilators use the handy coupon.

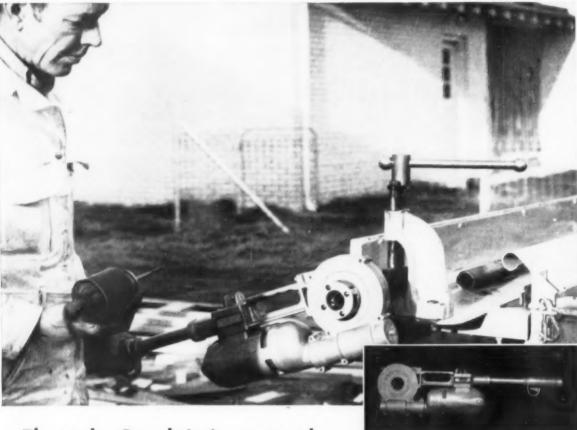
There's a fresh look at FASCO

FASCO INDUSTRIES, INC. North Union and Augusta Streets Rochester 2, New York

Please send me full information on the new Fasco power range hoods and ventilators.

Name Company

ECM-1157



Threads Conduit in seconds ...the Lawco, Jr. PORTABLE PIPE THREADER

Here's the answer to those slow, tiring, hand-threading jobs. The Lawco, Jr. Portable Pipe Threader does the work in seconds. This modern portable power tool threads the smallest to the largest conduit. Simple adapters and speed reducers handle pipe from 1/4-inch to 6".

Its operation is simple. Just position Lawco, Jr. on the conduit, press the trigger, and the power unit drives the cutting dies. You're finished in no time, and right at the location where you are installing the conduit.

And Lawco, Jr. comes in handy for other jobs, too. Several are illustrated at the right. In addition to these applications, you can use your Lawco, Jr. for driving nuts and bolts, and hoisting weights up to 500 pounds.

This light weight (20 lbs.) tool is precision built for years of service. Write for details.

VELOCITY POWER TOOL CO.

201 North Braddock Avenue, Pittsburgh 8, Pa.

The Lawco, Jr.—portable, versatile, compact. Does a variety of jobs faster, better.



Augering operation with Lawco, Jr. Efficient in vertical or horizontal operations.



Post hole application using square shank. Lawco, Jr. does it faster.



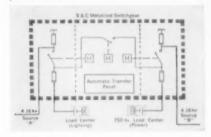
There's nothing better for pulling wire through conduit than the Lawco, Jr. The unit's portable feature speeds work.

FOR INDUSTRIAL HIGH-VOLTAGE POWER CIRCUITS -

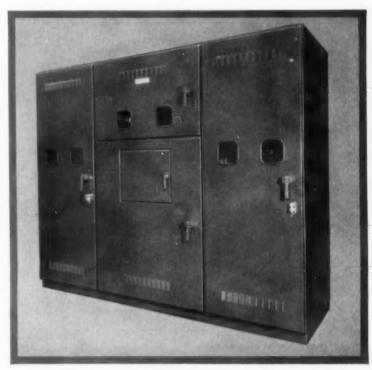
in your switchgear-buy S&C Metalclad Switchgear-Save 50 %

Industrial circuits do not have transient faults. They cannot be re-energized immediately after an outage.

Hence costly circuit breakers are unnecessary. S&C Power Fuses give the right protection.



Source A normally supplies the Lighting Load, and Source B normally supplies the Power Load. In case of power failure of either source, the S&C Standard Automatic Transfer Panel (located in the center bay) goes into action. It causes the S&C Moto-Draulic Operators |4| to actuate the "source" and "tie" load interrupters transferring both loads to the live source, insuring service continuity.



S&C Metalclad Switchgear with automatic transfer installed in the Methodist Hospital, Indianapolis, Indiana, Architecti D. A. Bahlen & San; Consulting Electrical Engineer: Ammerman-Davis & Stout Co.; Electrical Contractor: Watson-Flagg Engineering Co. One of two such units, this switching center serves the hospital's Main and Center Wings. A similar unit serves another building.

For industrial, commercial, and institutional highvoltage power circuits, conductors run in cables or conduits. They are not exposed to lightning, falling trees, rodents, wind, or ice which typically cause transient faults.

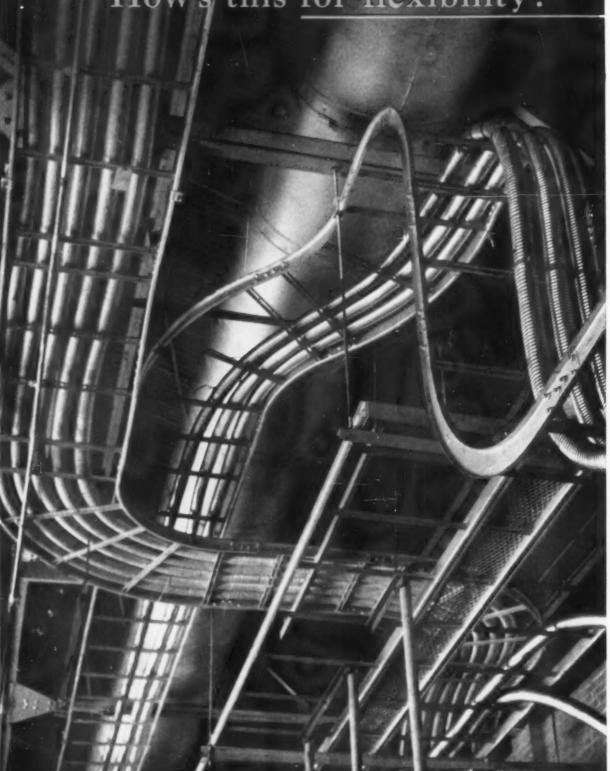
Consequently, the only faults that occur are permanent faults and S&C Power Fuses give the right protection against them. The quick reclosing feature of expensive circuit breakers is of no value here. S&C Metalclad Switchgear—by using S&C Power Fuses rather than circuit breakers, and by incorporating load interrupters for full load switching—

brings substantial savings in switchgear costs—sometimes as much as 50%.

S&C Electric Company, 4433 Ravenswood Ave., Chicago 40, Ill. In Canada: S&C Electric Canada, Ltd., 8 Vansco Road, Toronto 14, Ontario.



How's this for flexibility?



ELECTRICAL CONSTRUCTION AND MAINTENANCE . . . NOVEMBER, 195

Design for the future NOW with Tiger Brand Armorlokt

Better than words, the big picture shows the complete flexibility of Tiger Brand Armorlokt when installed in an open rack system. New cables can be added easily any time when your electrical load increases . . . as it surely will in the years to come.

Remember the splicing advantages of this cable, too. It's not likely, but if Armorlokt is damaged by a crane or some other object, you simply insert a splice box. Compare this to cable in rigid conduit; if it's damaged, you have to pull the entire cable out (if you can get it out) and start all over.

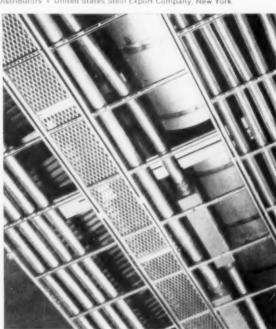
If you want to look to the future while designing today, think seriously about Tiger Brand Armorlokt for new construction or modernization. It is made in a complete range of sizes and constructions. Just ask your AS&W salesman.

AMERICAN STEEL & WIRE DIVISION, UNITED STATES STEEL, GENERAL OFFICES: CLEVELAND, OHIO

Columbia-Geneva Steel Division, San Francisco, Pacific Coast Distributors Tennessee Coal & Iron Division, Fairfield, Ala., Southern Distributors . United States Steel Export Company, New York



Flexible Armorlokt eliminates strain at boxes.



Splices can be made anywhere along cable.

Watch the United States Steel Hour on TV every other Wednesday (10 p.m. Eastern time).



USS TIGER BRAND ELECTRICAL WIRE & CABLE

A STANDARD TIGER BRAND CABLE FOR EVERY SPECIAL JOB

- * ASBESTOS WIRE AND CABLE
- · MOLD CURED PORTABLE CORD
- * SHOVEL & DREDGE CABLE
- . VARNISHED CAMBRIC CABLE
- * INTERLOCKED ARMOR CABLE
- * SPECIAL PURPOSE WISE & CABLE
- * ARRIAL, UNDERGROUND AND SUBMABIN



UNITED STATES STEEL



Make all common connections with just 3 color-coded **SCOTCHLOK** Electrical Spring Connectors

Strong . . . fast . . . pre-insulated—the tightest gripping electrical wire connectors you can use! Just 3 sizes of "SCOTCHLOKS" handle all common connections. And look at the features: Special steel shell prevents cut-through . . . "live" spring action prevents thermal toosening . . . unbreakable vinyl insulation doesn't dry out, chip, or crack . . . long conforming skirt protects wires, prevents flash-over. Exclusive triangular shape for easy "turn-on" application. And you know your splice is tight because it feels right!

FREE SAMPLES!

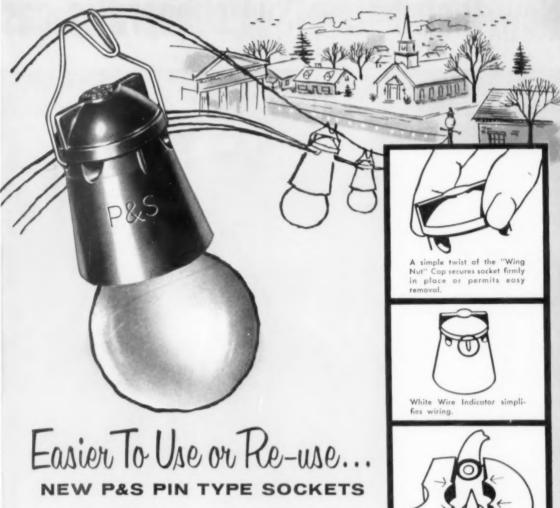
Tons of holding power in a fraction of an ounce! See for yourself how tight the grip—50,000 psi!...how permanent the holding power! For samples of all three sizes, just write on your letterhead to 3M Co., 900 Bush Ave., St. Paul 6, Minn., Dept. CB-1157.

Made by the makers of "SCOTCH" Brand No. 33 Electrical Tape

SCOTCHLOK Electrical Spring Connectors

The terms "SCOTCHI" and "SCOTCHLOK" are regurred trademarks of Minnesota Mining and Manufacturing Company, St. Paul 6, Mint Export Sales Office: 99 Park Ave., New York 10, N. V. In Canada: P. O. Box 757, London, Oniano.





Any time, any place, or any weather, the new 5464 P&S Pin Type Socket is the easy, dependable answer for temporary decorative lighting. The 5464's are applied directly to the wire. No stripping. Sharppointed pins pierce insulation forming positive wire contact with absolutely no insulation injury. Wires are firmly held in place when socket cap is tightly screwed down. Sockets disconnect easily for use over and over again.

- · Streamlined, functional body sheds water.
- Extra ring molded in cap thrusts wires into position.
- · Wire hook supplied with every socket.
- · Contact pins riveted to prevent loosening.

Write Dept. ECM-32 for free catalog information.



Exclusive patented* four-spline construction automatically centers No. 12 or No. 14 wire insuring positive connection,

*Pat. No. 2,751,568

- · Long-life plastic cap and body.
- Rated 660 Watts, 250 Volts.
- · Listed by Underwriters' Laboratories,



9, NEW YORK

60 E. 42nd St., New York 17, N. Y. 1440 N. Pulaski Rd., Chicago 51, III. In Canada; Renfrew Electric Limited, Renfrew, Ontario

MAKE THE COMPLETE JOB COMPLETELY P&S

New Distribution Switchboard is easier



The new standardized switchboard accepts any combination of seven different types of protective devices: G-E molded case and large air circuit breakers: current-limiting molded case circuit breakers; combination circuit breakers and current-limiting fuses; fusible interrupter switches; and power protectors. In fact, the new Type DR allows you to add, replace or rearrange more types of protective devices in more combinations than ever before

possible; in the field...quickly...and with minimum labor. The new Type DR Switchboard comes in standard 28", 35" and 17" widths. It is designed for 600-volt or less service and braced for 50,000 amperes asymmetrical (40,000 amperes symmetrical) short circuit current faults as standard, and for 100,000 amperes asymmetrical (85,000 amperes symmetrical) optionally. Its mains are rated 800 to 1,000 amperes.

to specify, estimate, install and expand

Built to pre-determined standards from pre-fabricated components, General Electric's new Type DR Universal Switchboard comes to you as a known quantity. It is preengineered and pre-tested to give assurance in advance of dependable on-the-job performance. We know its IC—we know its ampere capacities—we know its exact dimensions, its safety parameters, the capabilities of each of its components and other functional characteristics. We know them and you know them—before delivery of the switchboard. In addition, this new design and construction provide these other important benefits:

Cut hours from engineering, days from delivery. You can easily lay out and compute for yourself the size and cost of this universal switchboard from published information. Standardization means short-cycle manufacturing . . . frequently allows delivery in as little as one week . . . assures adherence to original delivery schedules, often in spite of last-minute specification changes.

Easier to install and maintain. Every terminal is easily accessible for quick, easy connections . . . unobstructed by bus bars or braces.

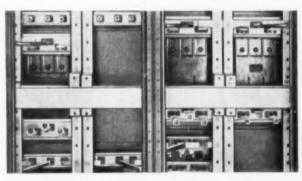
Easier to add capacity. You can easily double the useful capacity of this switchboard for future expansion or unexpected load requirements simply by adding an extra set of pre-drilled bus bars. Bus bars are silver plated, providing low contact resistance.

Easier to modify or expand. New switchboard sections can be added without special fabrication and with assurance of match and line-up. Breakers and switch units can be added or removed without disturbing the established load connections.

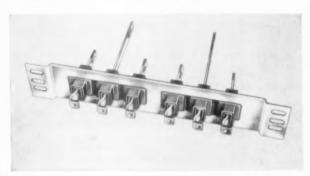
See your G-F. Representative or G-E Distributor for complete information on Type DR. Ask for Bulletin GEA-6627. Or write to General Electric Company, Distribution Assemblies Department, Plainville, Conn.



New molded bus insulator adds reliability. Molded in one piece of glass fiber-reinforced polyester, a new insulator increases the reliability of the entire switchboard. This insulator has high impact strength, high are resistance and low moisture absorption.



Horizontal busing provides "elbow room," cuts installation and maintenance time. Main bus hars are at mid-height with vertical step-down bus bars off to each side. Entire rear of switchboard is open, above and below main bus, for full working access to back-connected protective devices.



Straight-in wiring, speedier installation with new stud assembly. Eliminates wire bending . . . allows "straight-in" wiring . . . opens up more working space to speed installation. Strong, light-weight, non-magnetic aluminum barrier mounts stud assemblies . . . minimizes heating from induction currents.





Latest in Fusible Components. This switchboard incorporates fusible interrupter switches with a 12-times load break rating at a price competitive with conventional pressure switches. Type QMR unit, left, is rated from 30-600A, and the Type LB-1 power protector, right, is rated 800-4000A.

Progress Is Our Most Important Product

GENERAL 🍪 ELECTRIC

HOW L-M INDUSTRIAL CAPACITORS GIVE A HIGH RETURN ON INVESTMENT

Raise low power-factor and reduce kilovars

...increase load capacity

...improve voltage conditions

... cut power bill



By N. K. DELANEY
Product Manager
Capacitors and Regulators
Line Material Industries

ow power-factor costs you money. With low power-factor you do not use your plant facilities efficiently. You also lose part of the electricity you pay for, because of excessive losses. Today, practically every plant has manufacturing processes with loads involving induction motors producing

low power-factor. These are such loads as machine tools, pumps, fans, compressors and conveyers.

The use of capacitors improves the power-factor of the load. This reduces the KVA demand, and therefore cuts power costs. It automatically increases the load capacity of the plant circuits, and provides better voltage for equipment operation and lighting. In addition to providing better operation of the plant, capacitors can substantially reduce power costs another way: where there is a power-factor clause, based on a study of the clauses of a number of utilities, capacitors can save many times their cost.

Two Examples of Savings With L-M Capacitors

These two examples are typical of the savings on power bills possible through the application of low-voltage industrial capacitors.

1. Small Industrial Plant

Here the rate structure included a monthly KVA demand charge, which averaged \$172.28. Installation of \$720 worth of capacitors cut the demand charge to \$137.80, a monthly saving of \$34.48. The savings will pay for the capacitors in 21 months. Here are the figures:

BEFORE Installing Capacitors

KW	40	152
KVA	and .	211
PF%	-3	72
Monthly KVA demand charge.		\$172.28

AFTER Installing

80 KVAR of 460 Voit Capa	ito	7.8
Approximate installed cost of		
capacitors	205	\$720.00
KW	pat (5	152
KVA	200	166
PF%	ma)	92
Monthly KVA demand charge.	14.0	\$137.80
Reduction in monthly KVA		
demand charge	20	\$ 34.48
Number of months required to		
pay for capacitors out of		
savings in monthly KVA de		
mand charge	- 4	21

2. Commercial Lighting User

Here the rate for a commercial user of a large amount of lighting equipment included a monthly KW demand charge with a power-factor penalty clause as follows: the monthly demand charge will increase 1% for each 1% the power-factor falls below 85% PF. Power-factor at the time was running around 76%. Installation of enough capacitors to bring the power-factor to 86% saved \$24.41 per month, which is paying for the capacitors in 25 months. It figures out this way;

BEFORE Installing Capacitors

11.70	10
PF%=	19.4
KVA =	158
KW =	120

AFTER Installing

30 KVAR of 230 Volt Capacitor

savings in monthly KW

demand charge..... -

30 KVAR of 230 Volt Capac	ife	rs
Approximate installed cost		
of capacitors	N 201 W 100	\$600,00
KW	-5	120
KVA	-	140
PF%	23	86
Monthly KW demand charge.	25	\$271.25
Reduction in monthly KW		
demand charge	10	\$ 24.41
Number of months required to		
pay for capacitors out of		

Both Large and Small Plants Benefit

Almost every size of plant having a power-factor clause in its rate structure can justify capacitors. Studies show that it is generally advantageous to improve the power-factor beyond the maximum rate of return, because even though the rate of return becomes less, it is still economically attractive, and besides, additional system power capacity is released. A rough rule is to provide improvement to 90-95 percent power-factor.

The best way to determine the capacitor kilovars to use is to calculate the actual dollar savings for various power-factor values for your particular plant condition. See examples at left.

Location of Capacitors

The maximum benefit from capacitors is obtained when they are located



Individual Dustproof Capacitor Unit

at the load. This is true for release of system capacity, voltage improvement, and power bill savings. On the other hand, other factors should be considered, such as load diversity, particularly when the plant contains a number of small loads. L-M engineers can help you with such problems.

Complete Engineering Service

As a large manufacturer of capacitors for utility applications, Line Material Industries offers complete engineering service on industrial capacitor installations.

Line Material development engineers will cooperate with you to determine the amount of capacity released by power-factor correction, voltage improvement, rate of return on capacitor investment, and the most advantageous capacitor location.

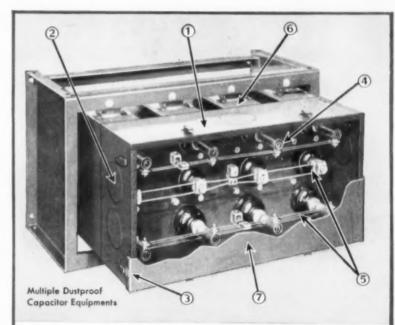
Complete Line of Industrial Capacitor Equipments

Line Material Industries offers a complete line of standard industrial capacitors, 230 to 575 volts, for installation at the motor, on the supply side of motor protective and switching devices, or at load centers.

Line Material capacitor equipments are dustproof. They can be floor, wall, or ceiling mounted. Multiple equipments are factory assembled into desired sizes, and completely wired. Installation is simple and fast. Equipments include boric acid indicating-type, terminal-mounted fuses.

Get Complete Information

Line Material capacitors may be the solution to your problem to increase load capacity, improve voltage conditions, or cut power billing. Call the nearest Line Material office for complete information and the location of the nearest distributor of Line Material equipment. Or write Line Material Industries, Milwaukee 1, Wisconsin.



NEW L-M INDUSTRIAL CAPACITOR EQUIPMENTS

Have Outstanding Design Features

- 1. Enclosure—one-piece all-steel construction.
- 2. Knockout-3-inch on all four sides.
- Cover—one-piece, fastened by spring clips, easily removed.
- 4. Fuses—boric acid indicating type, terminal mounted.
- 5. Internal Wiring-factory assembled.
- 6. Unit—strong solder-sealed bushings with low temperature Elemex liquid dielectric.
- Finish—primer followed by one coat of alkyd-resin paint.

Available in standard three-phase and single-phase ratings, 230, 460, and 575 volts.

Sold to industry through distributors. Call the nearest Line Material office for location of nearest distributor or write Line Material Industries, Milwaukee 1, Wisconsin.



MCGRAW-EDISON COMPANY

Transformers—Capacitors—Reclosers
Protective Equipment—Street Lighting
Power Switching Equipment—Regulators
Line Construction Materials—Fibre Conduit.



31

MICRO SWITCH PRECISION SWITCHING

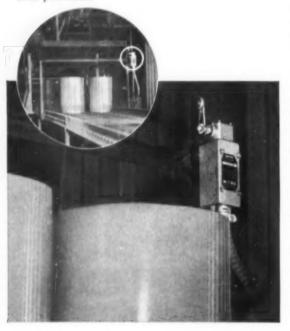


How MICRO SWITCH Precision Switches are used to speed material handling ...MAKE IT MORE AUTOMATIC

Switch stops overhead conveyor if parts fail to transfer

This overhead conveyor carries cans through a drying oven. The angle increases as it meets the roller conveyor, so the painted cans slide off of the hangers and on to the rollers. If cans fail to detach, they contact a hinged barrier which actuates the switch and stops the conveyor.

Close-up shows heavy duty Type ML switch which will handle up to 1½ H.P. at 220 vac. The roller lever actuator is adjustable through 360 degrees, positively locking in any position. The entire head assembly can be faced to any of four positions.



Your production dollars can go farther with MICRO SWITCH Precision Switches. Your nearest Authorized Distributor has full stocks for every plant use. Look under "Switches, Electric" in the Yellow Pages.



As the operator slides the box into position under the stapler, it slides over Switch A. The switch operates to start the conveyor motor just enough to bring the next box into reach. When the carton is in position for stapling, it actuates Switch B (beneath the metal plate). This causes the two guide rails to converge on the carton and guide it in a straight line through the stapling operation.

Close-up shows Switch A, an adjustable roller lever switch which is very popular with plant engineers. It is very versatile—may be adjusted horizontally through 360 degrees and vertically through 225 degrees, positively locking at intervals of .12 degrees.

MICRO SWITCH

A DIVISION OF MINNEAPOLIS-HONEYWELL REGULATOR COMPANY

In Canada, Leoside, Taronto 17, Ontorio . FREEPORT, ILLINOIS

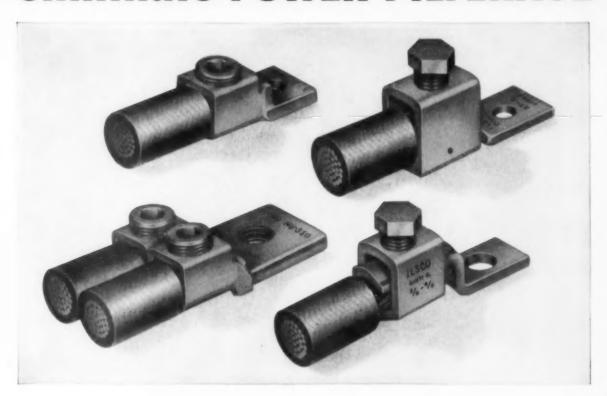


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eliminate POWER PILFERAGE



with connectors made the ILSCO way

Everyday, more and more electrical designers and engineers specify and recommend the purchase of Ilsco connectors because they know they get these important added benefits:

100% pure electrolytic seamless copper gives Ilsco connectors 100% conductivity. The copper is cold-worked to preserve its natural properties.

Compact, light-weight Ilsco connectors possess strength, secureness and capacity equal to or greater than much heavier and larger cast alloy types. You save space, handling trouble and money. Ilsco connectors do not overheat. Under normal conditions, operating temperatures remain as much as 50% below permissible UL maximums. That means greater safety, fewer trouble spots in your layout.

Join the ranks of Ilsco's satisfied customers. Find out how much time, trouble, worry and hard cash you can save.

Write for your free copy of Catalog # 50 and samples. Dept. C-11.



CONNECTORS • FABRICATED TUBES • NEUTRAL BARS
SOLDERING LUIGS • STAMPINGS • TERMINAL BLOCKS
SHADING COILS • WIRE-REINFORCED FUSE CLIPS



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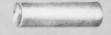
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Johnson Motors Choose Kuhlman For New Multi-Million Dollar Plant

With the completion of this new ultra-modern plant at Waukegan, Illinois, Johnson Motors, the nation's leading manufacturer of outboard motors, now claims the largest captive die casting operation in the world.

The electrical energy for operating the Johnson plant is supplied by Kuhlman Saf-T-Kuhl load center transformers (see illustrations), chosen to meet the requirements of the new plant.

Like these engineers, you'll find Saf-T-Kuhl's quiet operation, safe performance and compact styling ideal for modern industry. To get complete facts and specifications, ask for Kuhlman bulletin CS-1000.



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Full ballast life depends on maintaining normal in-ternal operating temperature of 105°C. For each 10°C. increase in temperature ballast life will be cut in half, ADVAN-guard prevents abnormal operating temperatures and assures full rated ballast life.

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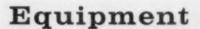


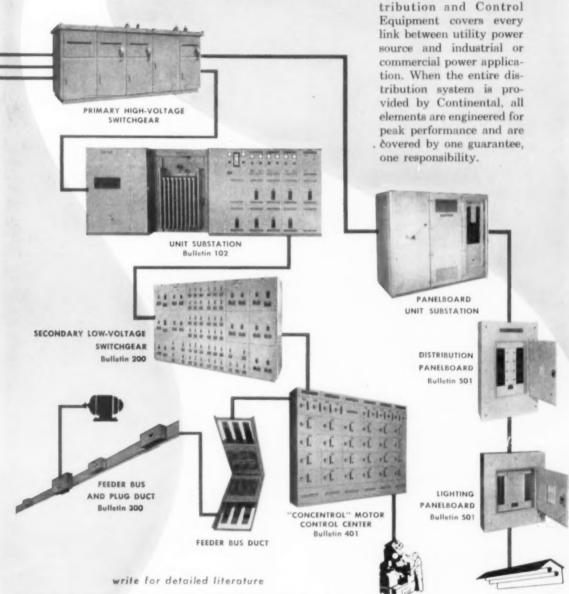


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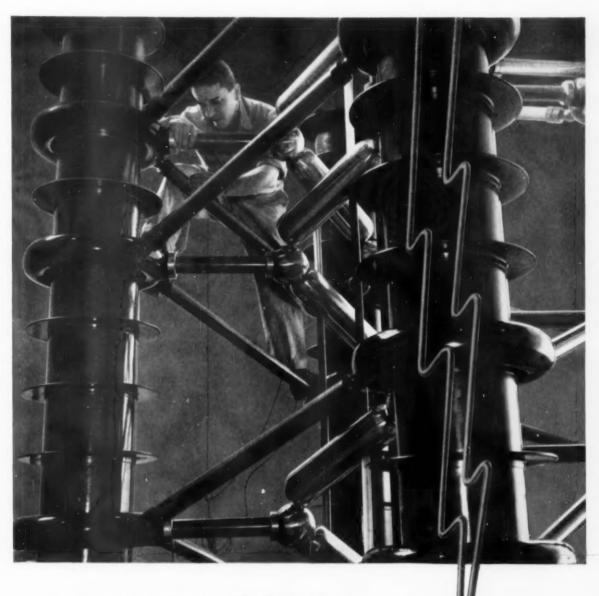
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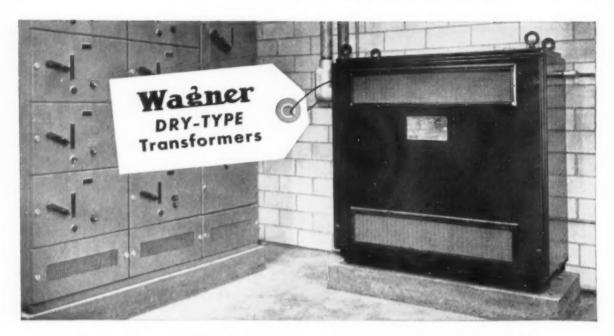
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Simplex Wire & Cable Company's new 1,400,000 volt impulse generator — the first of its kind to be installed in North America — represents just one aspect of research at Simplex. Simplex scientists and engineers originated the process of vulcanizing portable rubber cords and cables in a lead mold. Simplex developed the first heavy-duty portable electrical cable — Simplex TIREX. The first truly moisture-resistant rubber insulation was the outcome of a commercially acceptable method of deproteinization developed by Simplex. Simplex designed the first interlocked armored cable for underground service — Simplex CONDEX. And now — Simplex C-L-X — the portable, corrugated metallic duct WITH SEALED-IN CABLE. SIMPLEX WIRE & CABLE CO., Cambridge, Massachusetts and Newington, New Hampshire.





Put the right voltage where you need it!

NO EXPENSIVE RE-WIRING. Wagner dry-type transformers, when installed close to your machines, portable tools, and lighting circuits, give you the right voltage for use directly from 460 or 600 volt power lines. No re-wiring is necessary—line losses are reduced—installation costs are low.

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PROVIDE FLEXIBILITY FOR CHANGING REQUIREMENTS.

Dry-type transformers, 3 through 300 kva, are built with Wagner Form W core and coil assemblies. This design permits less weight per kva with correspondingly small cases that are easy to install—easy to move whenever changes in plant facilities are required.

ECONOMICAL TO MAINTAIN. These units have no liquids, valves, gaskets, or gauges to cause maintenance problems. The totally-enclosed types are completely sealed from all contaminating materials by sheet steel cases. Maintenance is reduced to the minimum.



Single-phase, 150 C Rise. 3 through 50 kva. Silicone insulated, totally-enclosed, non-ventilated. For indoor or outdoor use. 80 C Rise —15 through 100 kva. For indoor use only.



Three-phase, 80°C Rise. 9 through 300 kva. Ratings through 30 kva are suitable for indoor or outdoor use. Larger ratings are for indoor use only.



Single-phase, 55 $^{\circ}\text{C}$ Rise. 1, 1 $\%_2$ and 2 kva. For indoor or outdoor use. Bulletin TU-57 gives full information. Write today.

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More Than Example

In Northern Illinois, electrical distribution for an entire residential community of 6000 homes is going underground. In St. Louis a new school building will go all-electric, including heat. In New York more than \$1,000,000 in electrical modernization including flush in-the-wall unit air conditioning is bringing an old hotel back to the first ranks in comfort, convenience and service to the community. In Houston an all-high-frequency lighting system is being installed in a new bank building.

The above items are just a quick sampling of current activities in this industry—as of right now. Each represents a type of project which has been predicted from time to time on this page. Each represents a project for which there was no practical full-scale prototype as recently as five years ago. Yet today they are all in some stage between planning and completion. The basics of feasibility and economics have already been decided by capable professionals.

Such projects are more than merely interesting as examples of new or unusual work. They challenge well-entrenched opinions, which, because they are widely accepted in the industry are rarely exposed to objective analysis in terms of present knowledge and the current temper of the market.

Take undergrounding of residential distribution. Everyone knows it's more expensive than pole lines and overhead services. The utilities, reasonably, don't want to pick up the extra tab. But the builder might, if he is given the chance. The aesthetic value of a pole-less residential community can be an attractive and salable feature in the highly competitive home building business today.

Electric heat, for schools or other buildings, is similarly hampered by traditional industry attitudes. These show up not so much in opposition, but in a lack of affirmative action. Is it a desirable load? Can it be served at a reasonable rate? Who is going to sell the job? Is our technology sufficiently advanced? What are the criteria for cost comparisons? While the electrical industry ponders such cosmic policies, the competition is busy signing up firm contracts.

When new ideas are boldly expressed in practical current construction, the question of feasibility for other application can no longer be considered in conveniently general terms. They must be evaluated more thoroughly in terms of the requirements of the specific project and in the light of present knowledge.

Um. V. Stuart

Light up with more UP-LIGHT from BENJAMUN UNITS WA GraybaR

Benjamin 60" Apertured Top Reflector is one of Benjamin's expanded and re-styled 90/100-w line available from Graybar . . . provides 15% uplight. New molded plastic lampholders are mounted in steel housings for extra rigidity. Designed for two 60" T-17 bi-pin lamps.

More light towards the ceiling means greater seeing comfort below. This new trend in illumination helps your customers get greater economy in lighting and a better return on their investment in machinery, equipment and personnel. The Benjamin units shown on this page are typical of the modern lighting fixtures available from Graybar nationally.

Graybar also offers you and your customers the assistance of trained lighting experts to assist in the study, planning, and recommendations of the lighting system best suited to the need from the most complete selection of lighting equipment and G-E lamps available from any one source. Contact any Graybar location for prompt information and service. We invite your inquiry.

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A Planning Guide to Improved Plant Lighting—A study of the economics of a Planned Lighting Program and the gains that may be made in terms of reduced production costs. Heavily illustrated.

Benjamin Industrial Fluorescent Lighting Bulletin—A 36-page bulletin thoroughly describing General Line and Protected Equipment, accessories and suspensions.



The new Benjamin RLM SD-1 Unit provides higher quality lighting due to 25% upward light, 27° shielding and special high reflectance porcelain enamel reflectors. Equipped with Springlox lampholders for easy-in easy-out lamp replacement and Lak Latch fasteners for simplified reflector removal. Available for 48" and 96" Slimline, 48" T-12 40-w Rapid Start, as well as T-12 800 ma. Rapid Start lamps.



New Benjamin Units for higher light output lamps get 40% more light from the new 800 ma. fluorescent lamps. "Lifetime" porcelain enameled reflectors with ultra high reflectivity deliver the fullest measure of high efficiency. Individual units or continuous lines: open or closed-end; solid or apertured tops; for two or three 48" or 96" 800 mg. Rapid-Start lamps.



Benjamin Diffuser-Reflector delivers almost twice the upward light. Series of 14 apertures direct 10.7% of the light towards the ceiling. Helps relieve disturbing contrasts between upper and lower room areas, reduces eye fatigue.

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Toughest type of electrical work —

FULL REPOWERING IN AN OLD BUILDING

An analysis of design and construction in the modernized electrical system for New York City's new Manhattan Hotel. Design was done by Cosentini Associates and Eitingon & Schlossberg Associates in close cooperation with Davidson Electric Company, electrical contractors on the job.

By J. F. McPartland



PULLBOX C (see riser diagram for lower floors) is located just outside wall of main switchboard electric room at left. Conductors making up individual feeders are wrapped with asbestos cloth tape within the box to keep conductors close to each other for minimum heating effect, to provide ready identification of conductors associated with each feeder and to protect each feeder against damage due to fault in any other feeder. Supporting trapezes holding lengths of cable turns are shown in the box.

HE building which is now the Manhattan Hotel was formerly the Lincoln Hotel. It was built over 30 years ago and was used up until three years ago. Since then the building has been closed and unoccupied. The building has 27 floors, roof mechanical rooms, a basement, sub-basement and subsub-basement. Original electrical service was dc, powering elevators, other motor loads and lighting throughout the building. Distribution and circuiting originated from a main de switchboard in the sub-basement. Rigid conduit was used throughout the building.

When modernization of the hotel was started over a year ago, the problem confronting the electrical engineer and the electrical contractor was a big one. It took over two weeks just to get enough light in the three basements to see what was there. The sub-basement was

flooded, and things were generally a mess. Tracing the routes of all the distribution conduits and overall study of the existing electrical layout was complicated by absence of any old plans on the building. Pre-design study and investigation was a dirty but necessary job. Throughout the building, it was necessary to use a sledge hammer to break into walls and closed spaces to find risers, pull and junction boxes and various conduit runs. Step-by-step, the old electrical system was traced in every detail. Size, location and general condition of all equipment were carefully noted and a rough plan was made of the overall system. On the basis of this initial study, a renovated system was designed for the building.

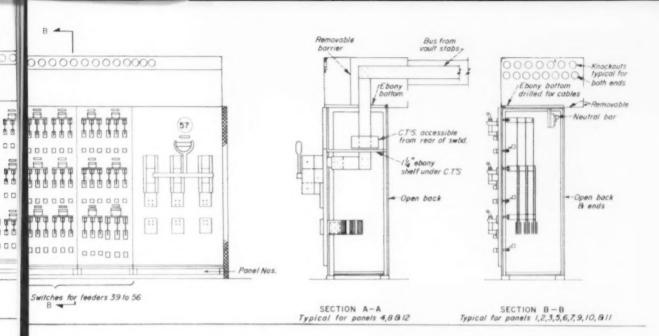
In laying out the new electrical system, maximum integration of existing equipment was a major design objective to assure economy in the very large job. Where possible and completely consistent with good design, existing conduit, junction and pull boxes, troughs and panelboard enclosures were utilized in construction of the modernized system. Throughout the building, existing riser conduits for lighting were refilled to 50% of occupancy with feeders to new lighting panelboards as shown in illustrations.

Maximum use of existing equipment was a particular advantage in the basements of the building where heavy concentrations of var-

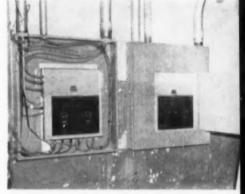
				F7 F8 F F F F F F F F F F F F F F F F F		MAIN AC SWITCH
WITCH	SWITCH	FUSE CAP AMPS	FUSE SIZE	FEEDER SIZE CARLE	COMO	NAMEPLATE DESIGNATION
-	400	200	200	4-250 MCM		Lighting -18th to 27th ft "C" riser
2	400	200	200	4-250 MCM	3"	-10th to 17th ft. "C" riser
3	400	200	200	4-250 MCM	3"	-3rd to 9 th fl "C" riser
4	400	200	200	4-250 MCM	3"	-18th to 27th ft "A" riser
5	400	200	200	4-250 MCM	3"	-IOth to 17th fi "A" riser
6	400	200	200	4-250 MCM	3"	3rd to 9 th ft. "A" riser
7	400	400	400	3-500 B I-350 MCM	31/2"	Air cond-26th & 27th fl
8	400	400	400	3-500 81-350 MCM	31/2"	24th B 25th ft
9	400	400	400	3-500 B I-350 MCM	3V2"	22nd & 23rd fl
10	400	400	400	3-600 BI-350MCM	A"	20th & 21st fl
II	400	400	400	3-600 BI-350MCM	4"	18 th & 19th ft
12	400	400	400	3-600 BI-350MCM	4"	16 th & 17th (1
13	200	200	70	4 No 6	11/4"	Roof power panel
14	200	200	110	4 No 2	11/2	Roof Itg panels
15	400	400	400	3-500 B I-350MCM	3/2"	Air cond. 3rd fl & cooling tower fan
16	200	200	200	4 No ¥o	21/2"	Concession areas distribution panel "MDP-CS
17	600	600	1		1	
18	600	600	600	6-250 MCM	2.21/2	Air cond compressor
19	5000	5000	4000	Bus	1	Main service Na I
20	400	200	200	4-250 MCM	3"	Lighting - 22nd to 27th ft "B" riser
21	400	200	200	4-250 MCM	3"	17th to 21st fl "B"riser
22	400	200	200	4-250 MCM	3"	12th to 16th fl "B"riser
23	400	200	200	4-250 MCM	3"	7th to 11th fl "B"riser
24	400	200	200	4-250 MCM	3"	3rd to 6th ft "B" riser
25	400	200				
26	400	400	400	3-500 &1-350 MCM	3V2	
27	400	400	400	3-500 & I-350 MCM	3V2	12th & 13th fl
28	400	400	400	3-500 81-350 MCM	31/2	
29	400	400	400	3-500 81-350 MCM	31/2	8th 8 9th fl

MAIN AC SWITCHBOARD is open-front, open-back type mounted in main switchboard room under lock and key, making the room inaccessible to unqualified personnel. Open construction assures cool operation of the substantially-sized busbar structure

ious power loads are spread out over large areas. As shown in the riser diagram of the basements, lighting feeders A and C are carried from the ac switchboard in the basement down into a ceilingmounted junction box in the subbasement. From this box, feeder C is run over to an existing box at which the existing riser conduits originate. Feeder A is carried to a pullbox on top of the old dc switchboard, where it picks up existing conduit to run to another ceiling-



OARD	SCHE	DULE				
SWITCH	SWITCH	FUSE	FUSE SIZE AMPS	FEEDER SIZE		NAMEPLATE DESIGNATION
NO.	AMPS GAP AM	GAP AMPS		CABLE	COND	MAMERIATE DE SIGNATION
30	400	400	400	3-500 & I-350 MCM	31/2"	Air cond6th & 7th fl
31	400	400	400	3-500 & F350 MCM	31/2"	Air cond -4th & 5th fl
32	200	200	200	3 No 3681No 2	21/2"	Condenser & chilled water pumps & "LP-SCA"
33	200	200	200	3 No.3/08 INO.10	2"	Power panel "PP-SSB"
34	400	400	400	3-500 B F350 MCM	31/2"	Lighting panels "LP-28"."LP-2C" & "LP-MB"
35	400	400	400	3-500 B F350 MCM	342"	Power panel "PP-3K"-3rd floor
36	600	600	600	6-350MCMB2No40	2-31/2"	Sub-cel fan rm. power panel "PP-5CI"
37	600	600				
38	5000	5000	4000	Bus		Main service No. 2
39	200	200	200	4 No 3/0	21/2"	Sub-cel ac distribution swbd
40	200	200	200	4 No 3/0	21/2"	Sub-cel Itg panels "LP-SCB" & "LP-SCC"
41	200	200	175	4-250 MCM	3"	44th 8 45th street vertical signs
42	500	500				
43	200	200				
44	200	200				
45	400	400	400	3-500 & I-350 MCM	3/2"	Coffee shop distr panel "MDP-CH"
46	400	400				Manhattan bar distr panel "MDP-MC"
47	400	400	400	3-500 B1-350 MCM	31/2"	Roof sign
48	400	400				
49	400	400				
50	400	400	400	3-500 81-350 MCM	31/2"	Ballroom distr panel "MDP-BR"
51	400	400	350	3-500 81-350 MCM	31/2"	Main kitchen power panel "PP-KI"
52	400	400	300	4-350 MCM	31/2"	Main kitchen power panel "PP-K2"
53	400	400	300	4-350 MCM	31/2"	Main kitchen power panel "PP-K3"
54	400	400				
55	400	400				
56	600	600				



EMERGENCY PANELBOARDS are mounted on wall at one end of main ac switchboard room. Each panel is supplied at 120/208 volts, 3-phase, by four 500 MCM's in 3½-in. conduit, each tapping the line side of one of the main 5000-amp switches in the main ac switchboard (off to right). Each panelboard has 400-amp capacity main bus and two circuit breakers protecting emergency feeders to emergency lighting panels and the stair and exit lighting panel.

of the board. Fused switches provide ready disconnect and full protection against short-circuit faults in the board or any of its feeders. Schedule shows full-capacity design of feeder distribution circuits. Fuses are current-limiting type.

Main service No 3

mounted box where the existing A conduit risers originate. Throughout the basements, re-routing of feeders was greatly facilitated by the use of very large new pull boxes—in some cases, new boxes in combination with old boxes. Accombination

5000 5000 4000 Bus

panying photos show many of the details of the work in the basements.

In the new design, the building was converted to ac distribution, supplied from a main ac switchboard in the basement. The board is an open-front, open-back type installed in an electric room under lock and key, accessible only to qualified personnel. The board is fed by three main 120/208-volt ac service bus ties to utility transformers under the sidewalk outside



FEEDER CONDUITS are shown here supported along the basement ceiling by a strong steel rack hung from the slab above. These conduits are run from pullbox C and enter pullbox A in the background.



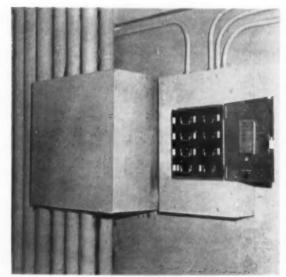
PULLBOX A is shown here from the side on which feeders from pullbox C enter. Wrapped feeders turning off from left of box into wall at right are the B lighting feeders which start their rise in existing conduit just out of sight inside wall. Feeders which continue straight are for air conditioning distribution panels. They, and other air conditioning feeders just out of sight behind wall at left, turn right and start their rise in new conduit from adjacent pullbox B.



4-\frac{1}{4}x \text{ A Bus bars to tenant metering trough trough to emergency distr. panel MDP-E2" to emergency distr. panel MDP-E2"

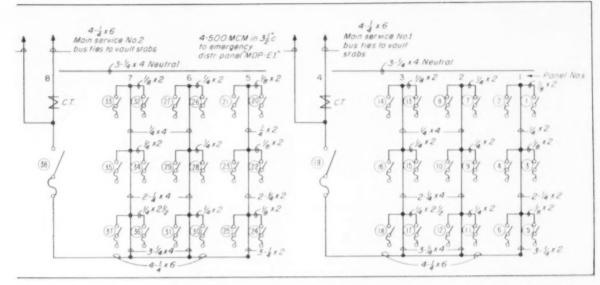
50.7. \(\frac{1}{2}\) \

BUS DIAGRAM shows size and arrangement of bus bars in main ac switchboard. This is a rear view of board layout, and



AIR CONDITIONING conduit risers are carried up central port of building through service elevator hallways. Arrangement is shown here on fifth floor. A total of 12 risers, six behind six, serve the complete air conditioning load in the guest rooms. From floor 4 to 27 each conduit supplies two floors. Here, six conduits enter a large junction box. The box provides plenty of space for the tap to the distribution panelboard and offers flexibility for future use of riser capacity. The panel contains fused switches feeding sub-feeders to individual air conditioning branch circuits. As each riser picks up its two panels, it is terminated.

PULLBOX B contains air conditioning feeders and a few do power feeders. Feeders came into box from pullbox A which is out of sight to left. Feeders are shown here turning back toward wall, running into part of box set in wall and then entering their conduit risers to the air conditioning distribution panels on the floors.

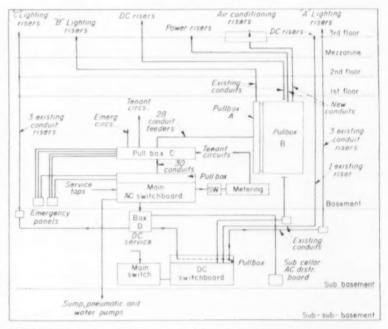


the number and size of bars are shown for only one of the three phases. All phases are similar. Engineer Leonard Padawer of Eitingon & Schlossberg Associates, who designed the entire system, also designed the main switchboard in detail.

the building. Each utility tie consists of four 6-in. by 4-in. copper busbars in a duct. Each tie is terminated at a 5000-amp main pressure switch fused at 4000 amps with high-interrupting capacity fuses matched to safely interrupt the maximum possible short circuit current. The main board contains disconnect and protection for 54 feeders to building loads-complete lighting, air conditioning and a wide variety of pumps, blowers, large air conditioning and refrigeration machines and other motor loads.

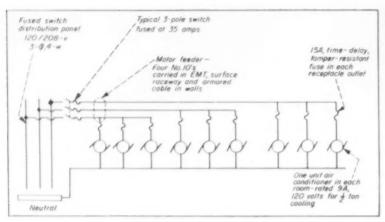
An interesting factor in the design of the main ac switchboard is the balance of air conditioning and lighting loads. As shown in the diagram of the board, each service tie supplies part of the air conditioning load and part of the lighting load. By combining the unity power factor lighting with low power factor (75%) motor loads the total load on each tie was limited. If all of the air conditioning had been supplied from one service supply, the total load would have exceeded the service capacity of one of the ties.

Although the vast majority of building electrification is ac, a de service was retained to power elevator drives and some de pumps and blowers. It was found more economical to maintain this de equipment intact than to remotor the machines for ac operation or to install rectifiers to operate the

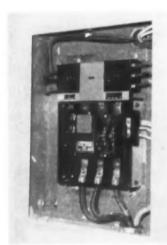


BASIC RISER plan shows location of ac and dc switchboards, basic interconnection of new and old conduit systems and the layout of large pullboxes which were required for effective utilization of as much existing equipment as possible. Circuiting was often made indirectly to pick up old conduit runs. Conduit risers A, B and C were existing and supplied from the dc switchboard. In routing A risers, the pullbox on the dc switchboard was fed from the ac switchboard to permit use of existing conduits to carry the circuits horizontally and vertically.

de loads from the ac source. The de switchboard was available and was readily put into good operating condition. Existing feeders in conduit risers from the board to elevator drives on upper floors were checked and maintained in use. And other existing dc feeders in conduit were maintained for other large dc motor loads—vacuum cleaning pump, house pumps and ventilation drives.



BRANCH CIRCUITS for unit air conditioners in rooms are laid out as shown. From the distribution panelboard, a 3-phase, 4-wire feeder is circuited out to receptacle outlets in the room. Each phase of the feeder supplies three outlets, and the loads are balanced from phase to neutral on the feeder. For each air conditioning unit, the branch circuit begins at the plug fuse in the 15-A receptacle outlet into which the conditioner is plugged. The plug and receptacle connection satisfies disconnect requirements. The 15-amp fuses provide motor branch circuit protection in accordance with NEC Article 430. For a total 9-amp motor load, protection could have been rated up to 30 amps, but then the use of the 15-amp receptacle might have been questionable. A 15-amp time-delay fuse satisfied all requirements, including the requirement to limit full load of air conditioning equipment on a circuit to no more than 80% of the rating of the circuit. Each 120-volt branch circuit is, in effect, tapped from a 120 volt feeder. Sizing of each phase of the motor feeder was based on 125% of full-load rating of one air conditioning unit (1.25 x 9A) plus the sum of the currents of the other two units (9 + 9). For the current requirements and the given lengths of circuits vs voltage drop, No. 10 conductors were selected. Protection of these conductors followed the usual procedure for sizing: take the rating of the branch circuit over-current device for one of the units (15A) plus the sum of the full-load current rating of the others (9 + 9). A 35-amp fuse was, therefore, used in each phase of the feeder. Although only one three-pole switch circuit is shown here, typical panels have six to eight similar feeder circuits



LIGHTING PANEL on twenty-third floor ce: Jins two 3-phase, 4-wire circuits. Each circuit supplies one of the two large signs on opposite sides of the building and is protected by a 3-pole circuit breaker. The panel busbars which the CB's tap are controlled by a mechanically-held magnetic switch mounted in the panel enclosure. The operating coil circuit of the switch is controlled by a time switch just to the left of the panelboard. As shown here, the time switch circuit had not been installed.

Typical details of the project are shown in the photos and diagrams. These photos were made while the job was under construction. They reveal an obvious close cooperation between designers and constructors. without which the job could not have been accomplished. Both Davidson Electric and Eitingon and Schlossberg Associates operated from fully equipped field engineering offices on the same floor in the building. As problems arose during installation, plans of design details were quickly expanded or revamped on the drafting tables. This type of coordination kept the job progress steady and assured effective and economical breakthrough of any bottlenecks.

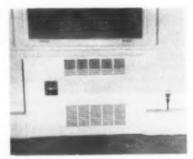
The wiring diagram at the top of this page illustrates one example of the engineering imagination which was brought to this job. The method shown for circuiting individual room air conditioning units was conceived from a thorough study of all possible ways to supply the units. The use of individual branch circuits run to the units from a centrally located



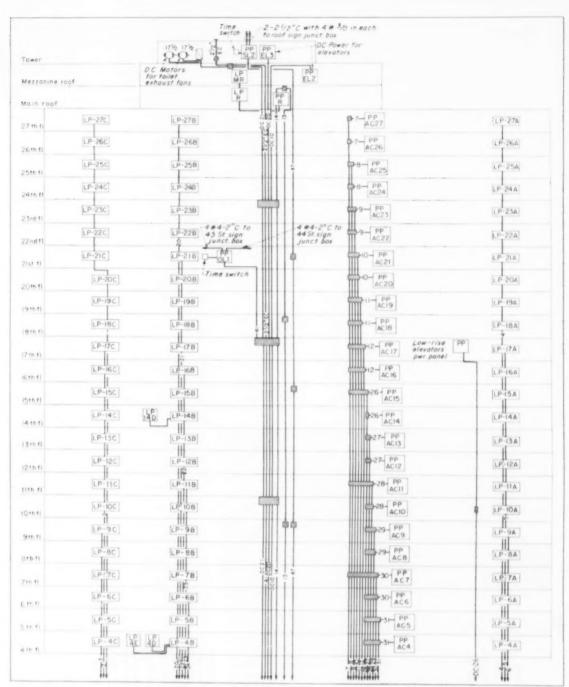
MOTOR SUBFEEDERS for unit air conditioners consist of four No. 10's in thinwall conduit carried from panelboard to junction boxes on wall as shown. From that point, four-conductor No. 10 armored cable is spliced in the box and run through the wall and then as underplaster extensions to receptacle outlets to the unit conditioners. Three- and two-conductor armored cable is used for the outlying extensions of the subfeeder.



SURFACE RACEWAY provided an effective wiring method for carrying air conditioning sub feeders from inside rooms (at right) to outside rooms (at left) through the hallways. The raceway was used to bridge between armored cable circuits used in inside and outside rooms.



UNIT CONDITIONER in each room is set flush in the wall under the window, with its condenser exhausting through a grill on the building. The cord connection to the fused convenience receptacle is shown at left. Cord is concealed in baseboard which covers pipe. Unit also provides heat by hot water piping, using air circulating fan,



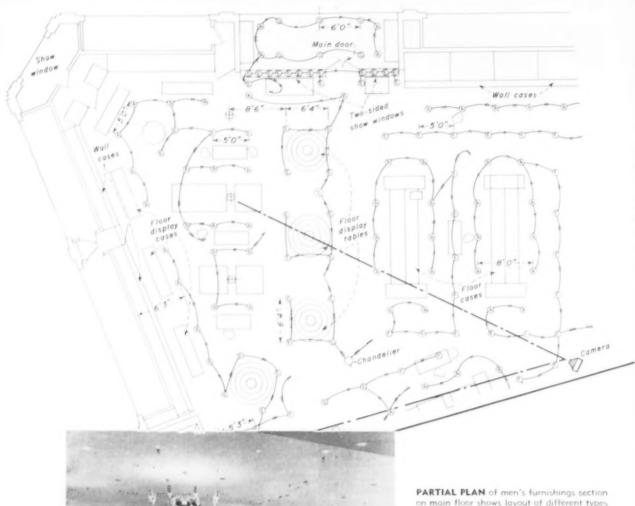
RISER DIAGRAM from fourth floor up shows conduit distribution for lighting, air conditioning and power loads. Existing conduit was used for lighting feeders, refilled to 50% occupancy. For elevators and miscellaneous roof power, existing dc feeders In conduit were utilized. Diagram here is from electrical plans, showing circuit numbers for ac and dc feeders corresponding to main switchboard switch numbers. LP designates lighting panels; PP-AC designates air conditioning power panels. Each air conditioning feeder supplies two floors.

branch circuit panelboard was found to be economically undesirable. The use of more than one unit on each branch circuit was also ruled out as unacceptable design.

Electrical design of the entire

electrical system in the building was under the supervision of Leonard Padawer, assisted by Rudy Pesce, both of Eitingon and Schlossberg Associates, consulting electrical engineers, New York, N. Y. Electrical construction work

was directed by Hy Feldman, general foreman for Davidson Electric Company, Inc., Brooklyn, N. Y. Thomas Pensabene and Bernard Davidson were also supervisory personnel for Davidson Electric on the job.





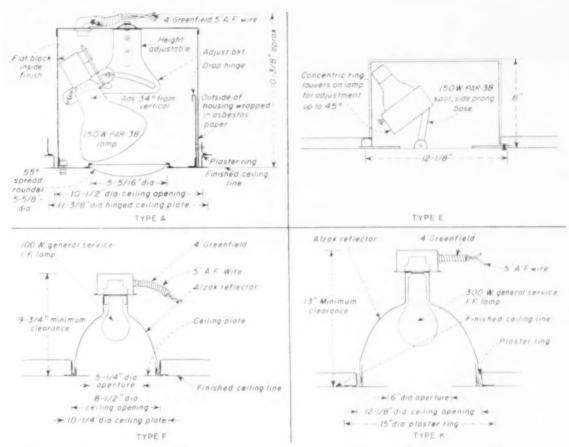
PARTIAL PLAN of men's furnishings section on main floor shows layout of different types of fixtures. Heavy lines on plan show angle included in photo of the area, at left. Circuiting of lighting is shown, indicating number of wires and circuits in home runs. Letters designating fixtures correspond to fixture schedule. Chandeliers are essentially decorative, containing a 60-watt lamp in each of eight arms and three 100-watt inside-frosted lamps in the center bowl.

Modern store depends upon . . .

LIGHT TO SELL CLOTHES

A case study in design of modern lighting integrated as a functional and decorative essential in a John David store, White Plains, N. Y.

By John Churko, Lighting Engineer, Lowy and Donnath Co. Electrical Contracting Engineers, New York, N. Y. MODERN, highly effective lighting system is an indispensable part of successful operations at a John David clothing store in White Plains, N. Y. Here, a variety of types and sizes of luminaires provide individual lighting effects suited to particular sales activities in different sections of the 2-floor store. Placement of



FIXTURE SCHEDULE for store shows four types of incandescent luminaires used in the store. Other types include: Type B—Same as type F but with pink inside collar; Type D—Used in main outside entrance area—Recessed unit with 300-watt, PS-30, inside frosted incandescent lamp; Type T—Same as type F but with 150-watt lamp and a pink inside collar and perforated pink outside skirt.

recessed incandescent luminaires is carefully related to required lighting intensities for store traffic and at points of sale. And other incandescent and some fluorescent luminaires are used to achieve various visual and decorative objectives. A section-by-section study of the store reveals many lighting design details.

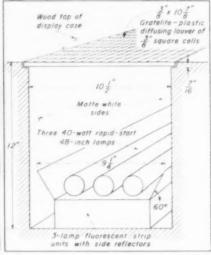
The main floor of the store is divided between men's and women's furnishings. On the men's furnishings side, general lighting is provided by recessed incandescent units, strategically placed with respect to layout of show cases and tables throughout the area. The luminaire layout was made on a layout of the floor cases and fixtures. In this way, lighting intensities were matched to exact requirements.

Three types of luminaires were used for the general lighting in the men's furnishings area:

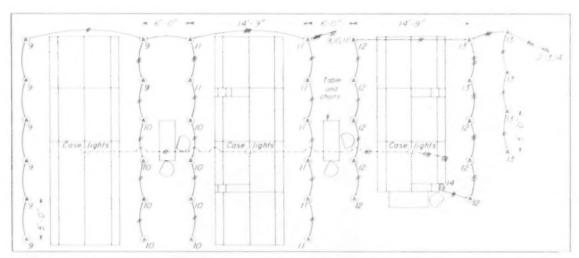


CEILING LUMINAIRES on second floor of store are shown here, looking from men's suit department into women's clothes department. Luminaires in foreground are type F with inside gold collars. Units in women's department are type T, with perforated pink skirts protruding down from the recessed opening. Suspended luminaire between the departments contains a 300-watt ,PS-30, inside frosted lamp and adds a decorative touch. Lighting intensities vary smoothly according to requirements at different locations throughout the area. Floor cases for men's suits are shown in foreground.





INDIRECT LIGHTING in men's suit department is provided by continuous row fluorescent strip units recessed along the wooden tops of floor display cases. The white stripe across the bottom of this photo is one such display case. This uplighting effect combines well with the incandescent lighting in the area to provide high, comfortable lighting levels where needed and an attractive appearance in the lighting result. The sketch at right shows details of the case lighting units. The continuous run of fluorescent units in a typical case consists of six 4-ft strip units plus one 2-ft unit, for a case length of 26-ft 8-in. Lamps on 4-ft strips are 40-watt, rapid-start; on 2-ft strip, 20-watt lamps are used. Light output from units is uniform with very low surface brightness and no dark spots on the diffusers above lamp end positions.



LAYOUT AND CIRCUITING of incandescent units around floor cases in men's suit department and circuiting of continuous fluorescent runs in tops of cases are shown in this plan.

1. Recessed units with 150-watt, PAR-38 floodlamps in adjustable brackets and 55° spread lenses are used to provide high level lighting at points where customers will inspect merchandise after removing it from display cases. Wherever these units are placed, the adjustable lampholder is positioned to direct light on the merchandise. These are the "A" units shown in accompanying illustrations.

2. Recessed, open-type reflector downlight units containing 100watt, inside-frosted incandescent lamps are used, mounted about 5½ ft apart in rows, above floor traffic areas which are not lighted by "A" units along display areas. These are the "F" units.

3. Recessed, shallow, open-type luminaires with 150-watt, PAR-38 side prong spotlamps in adjustable holders (up to 42° from vertical and 360° horizontally) with louver and filter holders are used to highlight merchandise on display tables. These are the "E" luminaires.

In the women's furnishings section on the first floor, type "A" fixtures are used around the perimeter of the area, again providing high lighting intensity along wall display cases where merchandise will be critically examined by customers. In the general area, here, layout of floor display cases and tables was not known prior to lighting layout. To meet the lighting requirements of just about any arrangement of such cases, rows of recessed type "F" units are closely

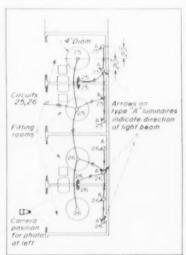


WALL CASES in men's suit department are lighted by recessed continuous row fluorescent luminaires under top of cases. Each troffer unit contains two 40-watt, T-12 rapid-start fluorescent lamps and is shielded by a ribbed plastic diffuser. These units provide constant, high lighting intensity on suits. When a customer removes a suit from the case for closer inspection, the recessed incondescents (type A luminaires) which are mounted along the ceiling in front of the cases provide a high level of lighting down on the suit. Incondescent light assures accurate rendition of colors and revea's details and texture of materials much better than diffuse fluorescent lighting can.



DECORATIVE CORNER of men's suit department is lighted by type A luminaires in a ring around a 5-ft diameter ceiling dome, with a direct-indirect lighting fixture suspended from the center of the dome. The fixture contains a 100-watt lamp in each of the four lower (direct) cones and a 60-watt lamp in each of the four upper (indirect) cones.





FITTING ROOMS in women's clothing department are arranged along one side of the area and are lighted as shown here. In the center of each room is an indirect bowl fixture containing a 100-watt, inside-frosted lamp which lights a 4-ft diameter reflecting ceiling dome for general room illumination. Two type A fixtures are mounted 4-ft apart in the ceiling just above the mirrors. The light output of these units is directed onto the area where customers stand when using the mirrors. Pleasant, high-level lighting is thereby provided for critical mirror inspection from all angles. The ceiling area shown reflected in the mirror contains type T, pink-skirted luminaires.

spaced in the ceiling of this area. However, because the area is devoted to women's wear, the recessed units are equipped with pink collars to give a slight warm, flattering tint to the light output.

On the second floor of the store, arrangements of 100- and 150-watt recessed luminaires are used in the same general way as on the first floor. In the men's suit department, the lensed 150-watt "A" units are mounted along all display areas. Traffic areas of the

floor are lighted by "F" units equipped with gold colored collars to produce a rich sunlight tint in the lighting.

As shown in accompanying sketches, the recessed incandescent units are the primary lighting elements throughout the store. In addition to providing high light intensities from very low brightness, unobtrusive ceiling sources, the incandescent units provide good color quality essential for accurate rendition of the many colors of cloth-

ing. Some fluorescent lighting is used along wall display cases and at mirrors. And continuous row, indirect fluorescent lighting is provided from units set in the top of floor display cases in the men's suit department. Incandescent lighting is used for local lighting in fitting rooms and for chandelier units.

The overall lighting and electrical installation in this store was made by a co-venture of Lowy and Donnath Co. and Delta Electric Co., White Plains, N. Y.

Power, lighting, audio and video wiring facilities installed in . . .

NBC's COLOR TV CENTER

. . . located at Burbank, Calif.

Tilt-slab and lift-slab construction, dual primary feeder system, elaborate lighting and dimming equipment, extensive grounding and intricate control facilities are features of this growing television production plant. Complete wiring of most-recent color studio was by electrical contractors Fischbach and Moore.

By Hugh P. Scott



ONE OF FOUR STUDIOS, this color TV production area contains large (90- by 100-ft) staging floor, seating capacity for 500 spectators, second-floor lighting control booth, overhead power grid of wireways and pigtail connectors, plus wide variety of various-purpose lighting fixtures, microphones, P-A speakers and cameras.

URING the past half-dozen years the National Broadcasting Company has developed a huge (and still growing) television production center in Burbank, California. The center already contains four 90- by 140-ft production stages, several smaller satellite studios and a modern 4-floor administration building. There are also extensive facilities for technical and physical-service requirements, utility and maintenance assignments, personnel and parking demands. This thriving TV nucleus has a 48-acre plot on which to expand.

Two of the four production studios were designed specifically for color programming; the most recent one, completed earlier this year, was planned in 2½ months and completely built and wired in an additional 7-month span to meet deadlines. This tight construction schedule was particularly critical for the electrical work, since the electrical contractors, Fischbach



FAST-GROWING TV CENTER in Burbank, California, already contains two large studios designed specifically for color productions, two additional stages for black-and-white programming, modern lift-slab administration building and extensive facilities for related services. Location on 48-acre tract provides ample room for further growth as requirements dictate.

and Moore, were responsible for all audio and video wiring in addition to that for power, lighting and control

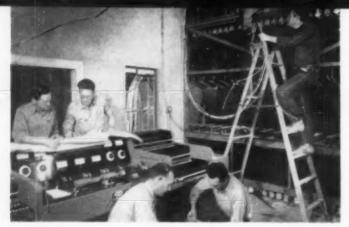
The Austin Company, designers and builders, speeded construction by the adoption of tilt-slab walls, with 42-ft pre-cast concrete columns and 16-ton wall sections raised into position by a special 45-ton crane positioned centrally inside the enclosed area. The electrical installation was accelerated through assembly-line techniques whenever repetitive operations occurred, power tooling, precise preplanning, close cooperation with other trades, plus exacting scheduling of materials to the jobsite.

Special and often unique problems of wiring design for the TV production center give unusual importance to the electrical systems design decisions crystalized at NBC in Burbank. Features of the systems are: (1) Primary selective dual 5-kv feeders between mainoutdoor and local-load-center-indoor substations to minimize the possibility of a power outage, (2) 4-bar low-reactance feeder busducts to technical power distribution boards, with 100% neutrals to handle large, unbalanced, sudden loading of the system, (3) busduct runs with reinforced corners and extra sway-bracing to resist possible earthquake shocks, (4) accessibility and flexibility of wiring through such mediums as ladder racks, lay-in troughs and hinged- or removable-cover wireways, (5) positive and dual identification of circuit conductors, and (6) provision for studio lighting requirements through a closespaced overhead grid of 50- and 90amp pigtail connectors served by wiring carried in accessible 6 by 6 wireways to control-booth patch panels.

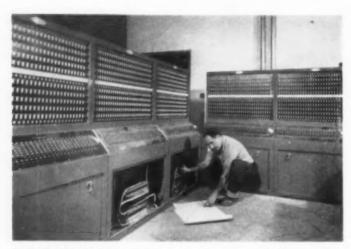
It is obvious that a television center must provide as much electrical flexibility as possible so that changes and growth may develop as new conditions and requirements dictate. This practical approach is repeatedly evidenced in NBC's Burbank plant, several instances existing where alternate methods are installed almost side-by-side so that operating personnel can intelligently compare, evaluate, select and plan for the future.

For example, in the color penthouse that serves two studios, dimming for one of the studios is controlled through Thyratrons, power being obtained via two 2000-amp 4-bar (100% neutral) 3-phase 120/208-volt busducts, with voltage raised to 132 volts by means of special booster transformers in order to compensate for a 10% voltage drop through the saturable reactors, thereby permitting the use of standard-voltage lamps in studio lighting fixtures.

Just a few feet distant, the second studio's dimming requirements are satisfied by a direct 4160-volt feeder service to a 1400kva transformer having dual secondaries, one directly providing



LIGHTING CONTROL BOOTH, with large viewing window overlooking entire production stage, contains elaborate master electronic dissolve-and-fader console flanked by tun banks of individual manual controls related to the many lighting circuits installed above the studio. Booth also contains patch panel (rear, right), plus series of. _____



FIVE PRE-SET PANELS, where dial controls permit establishment of ten different lighting intensities for 140 dimmer-controlled circuit hookups. These ten lighting arrangements can then be successively switched or faded, as later desired, by operating pushbuttons or dimmer levers on master control cansole. Dimmers are located directly above in penthouse.

132 volts for mag-amp dimmers, and the other supplying 120 volts for all other lighting circuits (controlled through mercury relay switches) which do not require dimming provisions. In both instances the end results are approximately the same, yet this side-byside arrangement of two methods provides an excellent opportunity for intelligent comparison.

Stage Lighting

Color stage lighting for the two studios combined contain over 2400 lighting outlets, powered principally through pigtail connectors mounted along closely-paralleled runs of standard pipe battens. At present, about 2000 various types of lighting fixtures are available for production purposes, many of these fixtures being lamped with high-output bulbs rated at 10,000 watts. Fixtures are focussed, connected and serviced from catwalks located between roof trusses, while oral direction of these lighting operations is facilitated through utilization of 2-way speaker-mike stations variously located along catwalks, at stage level and in control booths.

Light-fixture connection pigtails are served through some 150 large screw-cover pull-boxes equipped with appropriate terminal strips. Wiring between PBs and control-booth patch-panels is carried through 50 6- by 6-in. removable-cover wireways. Wiring consists of multi-color conductors, six conductors per duct; wires being bound

together every 4 ft, while a bare No. 12 wire is provided for every individual plugging-strip ground.

This wiring operation was one of several where production-line methods could be used advantageously, for all circuits, collectively requiring over 300 miles of wire, were pre-measured before cutting; cable reels being set up in tandem formation in a long basement corridor so that conductors could be pulled out simultaneously by a power winch. Conductors were then bunched and skeined with glass tape; clearly identified by coded decals plus large lettering applied on glass-tape bands by means of feltdipped pens; pulled through air shafts into studios with the aid of an air winch, then pulled up to truss levels and laid into square wireways with the use of additional winches, pulleys and bull wheels. In the words of electrical superintendent Seal, they "just didn't mess around with manual stuff!"

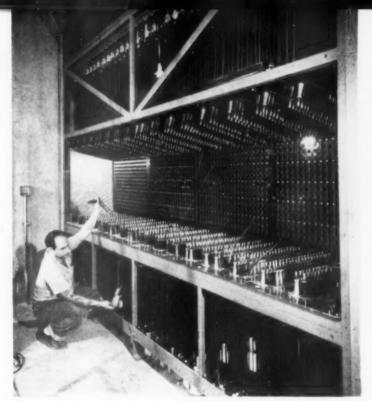
Central Control

Lighting control booths, overlooking stages from the second-floor level of the central building "core", contain mammoth electronic consoles, the two boards combined controlling approximately 300 basic circuits through already-mentioned dimmer banks located directly above the booths in the color penthouse.

In each booth, the master monitor control board, with dissolves and fade section in the center, and with individual manual controls for each circuit on two flanking sections, is surrounded by banks of pre-set panels and the necessary patch panel for connecting the lighting circuits to be controlled. Since each board contains over 2400 separate controls, the two studios combined can create nearly 5000 adjustments for lighting intensity, color, saturation and pattern.

Each board controls approximately 150 dimmers plus an additional 50 no-dim circuits, and dimmers are controlled through 10-scene preset control panels that enable operators to set up lighting intensities on all dimmers ten scenes in advance, with final switching and fading from one scene to the next accomplished by single push-buttons and levers.

Dimmer control boards also make it possible to assign each dimmer



FRONT OF PATCH PANEL in typical lighting control booth contains maze of plugging cords and jacks (functionally equivalent to those on a telephone switch-board) that permit interconnection of various circuits and dimmers. Dimmers (located in overhead penthouse) are, in turn, sequence-controlled from master console in accordance with pre-set intensities. Walk-in access aisle at,

independently to any one of six master groups, controllable by single dimmer handles, this being a selective feature which is particularly useful when moving from one area to another in a large dramatic type of show.

Functionally, the boards are split in half for independent operation, thereby (with both studios in use) permitting four small color shows to be set up independently for later re-creation.

As a visual check for controlboard operators, illuminated indicating annunciators, located in front of consoles above large viewing windows that overlook studio stages, keep operators informed as to which circuits are then-connected, through patch panels, for service.

Audio-Video

Inasmuch as the electrical contractor was also responsible for the wiring of audio and video facilities, it is pertinent to briefly discuss these centers which are located between the two color studios in the structural core.

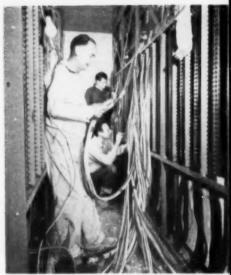
In this connection it should first

be mentioned that color camera chains used in the Burbank studios contain three image-orthicon tubes each, and that all cameras, variously mounted on pedestals, panorama dollies and overhead cranes, have lens turrets permitting the selective use of four different lenses. Outputs from these various cameras are carried to one of two video control rooms where engineers, observing both color and black-and-white monitors and oscilloscopes, can adjust cameras remotely for best picture quality.

As presently applied, the output from any camera may be televised separately, or it may be lap-dissolved into or presented conjunctionally with the picture from another camera; or 4-way split-screen super-positions, with four different pictures combined on the screen at the same time, may be achieved.

Video engineers can talk to any cameraman via telephone individually, or an open conference circuit may be used to permit discussion between technical directors, light control engineers, all cameramen and video operators.

Audio control is located adja-



REAR OF PATCH PANEL reveals extensive wiring required for the flexible combination of 1260 lighting outlets in a studio with 150 dimmers and 50 additional no-dim control hook-ups, Deadfront construction of panel eliminates shock hazards, while automatic deenergizing micro-switches permit "cold" making and breaking of contacts.

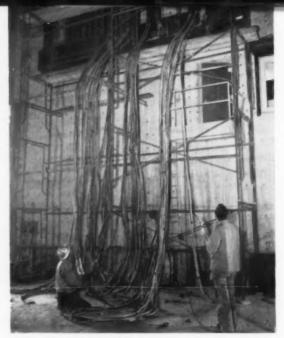
cently to video rooms and isolated, when desired, by sliding glass doors. It is facilitated through the use of separate monitoring speakers, permitting critical independent adjustment, while special audio effects may also be achieved through the use of echo chambers.

Technical Facilities

The 2-story technical building is located between the two color and the black-and-white pair of studios, and designed to serve as master control center for all West-Coast originations. It contains audio and video controls necessary to coordinate all four studios into a single giant operation. Here are located audio and video amplifiers that receive programs from the Burbank studios for transmission to the network through telephone lines, or, conversely, they can receive programs from the telephone company for transmission to the Burbank studios. Synchronizing generators to control signal timing of the entire plant are likewise located here, while film equipment facilities combine telecine, video and film control rooms, projection studios and



WIRE FOR STUDIO LIGHTING (for the connection of over 1200 outlets positioned along overhead pipe battens with control-booth patch-panel) was pre-measured, banded at 4-ft intervals, identified and code-labeled in basement corridor located beneath color studia service "core". Wire reels were tandem-arranged in banks of six to permit the simultaneous pulling of conductors. Then, . .



LIGHTING CIRCUIT CONDUCTORS, skeined into 6-wire groups, were pulled vertically through 26 removable-cover 6-by 6-in. wireways extending upwards from top of second-floor lighting control booth to studio truss level, then horizontally to 76 large screw-cover pull-boxes equipped with suitable terminal strips for ultimate connection of pigtail lighting-fixture connectors.

announcer booths, large enough to accommodate two complete camera chains, for the presentation of newscasts and commercials.

In the video room, engineers can adjust cameras for optimum picture quality, while any film camera can be patched to any studio, enabling that studio to start and stop projectors associated with the camera, and to switch the picture and sound from that camera through that studio's camera switching system.

In the adjacent film control room, primary film programs may be assembled or special events, such as election returns, may be set up. Here is located a revolutionary control console, similar to those used in live studios, where audio engineers, technical and program directors can monitor and control ten separate picture and sound inputs to the studio.

Also included among the many electronic facilities in the technical building are those for "lenticular kinescoping" of color programs, thereby permitting central and West-Coast viewers to see all color shows in the same time-slots that East-Coast televiewers are favored with. This process for the recording of color programs on film was developed conjunctionally by Eastman Kodak, RCA and NBC.

Shows produced in these Burbank studios are relayed to the network via coaxial cable under normal circumstances. However, should any relay facility fail, Burbank productions can be beamed direct to NBC's transmitter atop Mount Wilson by means of large



THYRATRON TUBES (two required for the switching and dimming of each one of 150 5-kw lighting circuits installed in one of the two color TV studios) are supported on factory-wired rack-and-gutter framework remotely located in penthouse above patch-panel in lighting control booth. Dimming of lighting circuits in the other color studio is by means of magnetic amplifiers.

dishpan transmitting antennas installed on top of one of the Burbank studios.

Inasmuch as this technical power control center demands exact voltage levels, separate 800-amp bus connections carry power from the local substation to series of 12-kva 120-volt single-phase Inductrol voltage regulators, equipped with 2-pole bypass switches, electrically interlocked with breakers in the main switchboard, for use in the event of an Inductrol failure.

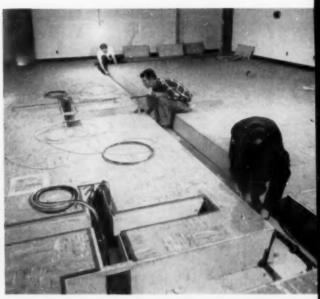
4160-Volt Distribution

The electrical provisions for the two black-and-white studios are roughly the same as those for the color studios already discussed. The lift-slab office building is similar to buildings of that type previously analyzed (see "Lift Slab Wiring Techniques, EC&M, June, 1954). They are both served through one 1500-kva and one 750-kva 4160-120/208-volt 3-phase substation.

Power for the entire Burbank installation is received at 34½ kv; this voltage is then stepped down to 4160 volts at NBC's main outdoor substation. Distribution goes underground via cables in asbestoscement ducts to local substations.



PIGTAIL CONNECTOR STRIPS, for main-stage battensupported lighting grid, were pre-assembled at floor level in adjacent satellite (rehearsal) studio. Note sound-absorbing acoustical blanket with retaining covering of muslin and chicken wire. Sound absorption was intentionally lessened in spectator sections in order to amplify live background reaction of audience.



FILM TELECINE ROOM, shown prior to installation of film equipment, indicates intricate floor trench system provided to carry audio and video wiring. Heavy ground system with Cadweld joints, for positive electrical grounding of all equipment, may be noted in main section of trench. Audio and video wiring, as well as that for power and lighting, was installed by electrical contractor.



CENTRAL EQUIPMENT ROOM in technical building contains rack space for present, plus contemplated future, audio and video assemblies. Overhead trapeze-supported ladder system is installed for cable distribution, thereby permitting easy accessibility to wiring and dropping of cables between rungs. Ladders also support grounding grid. Note that . . .



SQUARE WIREWAYS with hinged covers provide access to wiring along upper face of racks. General illumination is provided by standard RLM 100-w incandescent units, while concentrated local lighting may be obtained through the use of rubber-insulated lamp holders on reelite extension cords, Electrician at left is forming in wires for audio jack field.

Feeders, consisting of four 350MCM 5-ky conductors each, are protected by 1200-amp air circuit breakers housed in outdoor pad-mounted switchgear cubicles adjacent to the main utility transformers. Extra

space, primary feeders and bus 20,000 kva.

While substations are located

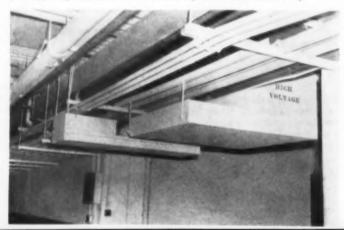
strategically to serve the office structures are already provided at structure, black-and-white studios, the main substation, to allow for technical building and refrigeraan ultimate substation capacity of tion compressors, the largest station is related to the color studios and its service buildings. There, AIR TEMPERATURES (both wet and drybulb) existing in any studio, office area, supply or exhaust duct in this TV center. can be remotely ascertained at this basement-located control center by pressing button related to location in cuestion, then noting pointer position on large central indicating dial Temperatures (critically important due to extent of sensitive electronic equipment installed) can then be remotely regulated from this master control point. Diagrams of cooling and fan systems, indicating bulls-eye lamps, recording instruments and wallrecessed 2-way intercom speaker-mike also promotes efficient supervision





POSSIBILITY OF EARTHQUAKE tremors, resulting in vibration and creation of stresses, dictated the provision of offset expansion joints in low-reactance busduct runs, with corner bracing and angle-iron sway bracing as pictured above. Power continuity was also insured through provision of dual primary feeders between main and local substations. Contractor designed many. . .

SPECIAL PULL BOXES to facilitate wiring and permit changes in feeder direction or elevation where space limitations were critical. Numerous interesting fabrication and installation problems were encountered due to extent of ducts and pipes related to air conditioning and all utility services, plus opposing desires to obtain both compactness and accessibility.



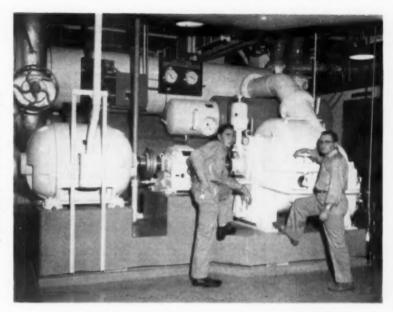
a 1500-kva transformer steps voltage from 4160 to 120/208. Separate secondary feeders serve a 5000-amp power section and an 800-amp lighting section in the station's main switchgear assembly. A third feeder bypasses the main transformer completely, carrying 4160-volt directly to a 1400-kva high-voltage dual-secondary transformer in the penthouse where current is provided at 132 volts for Mag-amp dimmers and at 120 volts for the no-dim circuiting in the studios.

Since dual feeders serve all local substations, protection against primary distribution outage is obtained by this selective feature. Also, since future expansion of the system is already provided for by appropriate spare ducts, cubicles and connection tees, the addition of this extra service at a later date will entail minimum delay and inconvenience.

Extensive Grounding

Grounding is critical due to the nature and extent of audio, video, lighting and power circuits. Therefore, a No. 4 stranded insulated ground wire grid is installed in all floor trenches and on all overhead cable ladders and racks, with all ground bus connections established by means of Cadweld joints, the entire grid being solidly bonded to the overall ground of the building structure.

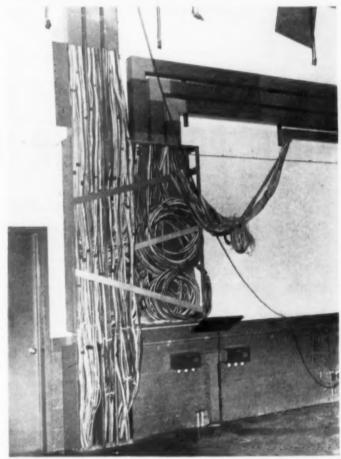
It is also of interest to note that much of the special equipment in these modern studios and techniCOOLING COMPRESSORS related to air conditioning system automatically go into operation in prescribed sequence whenever cooling load increases, then cut out in reverse order when load drops. Two 250-hp compressors (each with 13 steps) plus several additional 100-ton units (that build up gradually to their peak capacities) are "locked in" to the system as required. Air conditioning requirements are great in this TV center, due to the frequent existence of 100-degree-plus autdoor temperatures in Burbank, and also due to greatly-increased lighting requirements for the televising at color productions.



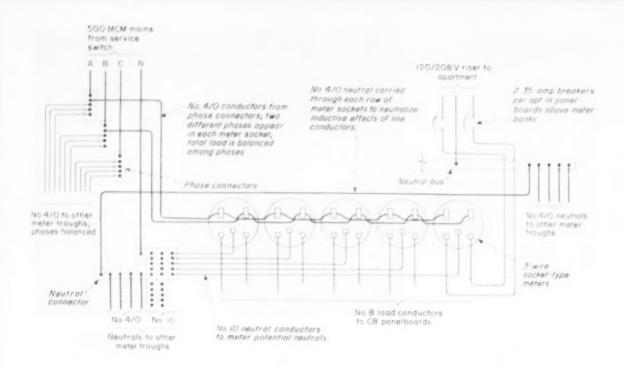


INCREASED LIGHTING requirements for televising color TV productions dictated closer spacing of overhead battens and pigtail connectors, greater variety and extent of fixtures, increased wiring and current capacities, and larger lamps, such as this 10,000-watt coiled-filament magulbipost globular spatlamp being studied by electrical project superintendent Jim Seal.

cal areas is specially mounted to minimize shock and vibration; power and audio conduits are kept as far away from each other as possible to reduce interference; microphone outlets are placed at least 3 ft away from ac receptacles, while crossings of audio and power conduits (when unavoidable) are made at exact right angles to each other.



EXTENT OF WIRING related to color TV power, lighting, sound and comerachain requirements is reflected by this installation view showing concentration of cable and square removable-cover wireways at typical panel point in one of the satellite studios. Accessibility of wiring was consistently stressed in order to permit maximum freedom for changing or augmenting the system.



DETAILS OF TYPICAL METER SOCKET WIRING

Apartment Installs

MORE POWER FOR APPLIANCES

Doubling service capacity provides for air conditioning plus two 20-amp kitchen circuits per apartment.

LECTRICAL modernization of the Dorchester Estates, Inc., 6-floor apartment building in Brooklyn, N. Y., called for additional wiring capacity to handle two new 20-amp kitchen appliance circuits plus a \$\frac{3}{2}\$-ton air conditioner in each of the 50 apartments. Kitchen appliance circuits were to be run immediately, as were circuits to existing air conditioning units. Wiring for additional air conditioners was to be installed as needed.

To meet these requirements, H. Davidson, electrical contractor of New York City, (1) increased the service to the building from four No. 2 to eight 500 MCM conductors; (2) doubled the service entrance

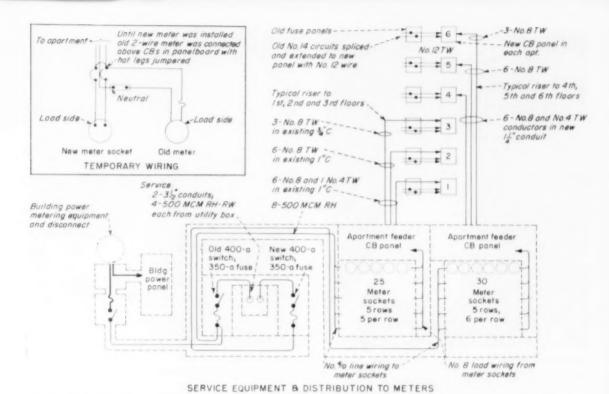
switching capacity from 400 to 800 amps; (3) installed completely new metering equipment and apartment feeder circuit breaker panelboards; and (4) increased the risers to each apartment from two No. 14 to three No. 8, 120/208 volts.

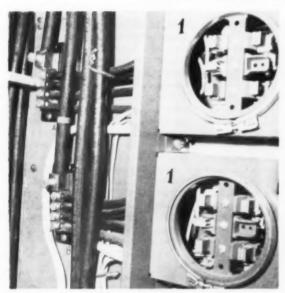
The service conductors were run in two 3½-in. conduits from a new underground concrete box at the building lot line. The old 400-amp service switch, still in good condition, was supplemented by an additional 400-amp switch, the old switch maintaining uninterrupted service to the building during the rewiring. This also permitted the tap to the building power switch, meter and panel to remain undisturbed, since existing building

power requirements did not change.

Division of load between the two service switches was maintained throughout the metering and distribution equipment. Two new banks of 3-wire, socket-type meters handle tenant metering, each bank being fed from one of the two service switches by four 500 MCM RH cables.

Meters were trough-mounted, five per row, five rows, in the left bank; six per row, five rows, in the right bank. Meters were divided as evenly as possible among the three phases; each socket was fed from two different phases to distribute the load. The four 500 MCM RH main feeders from each 400-amp service switch were terminated in







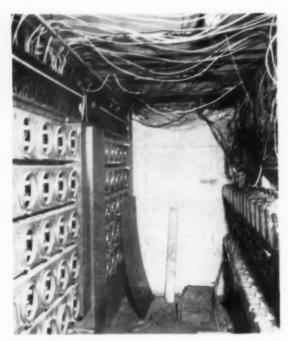
MAIN FEEDERS terminate in connectors mounted in vertical wireways at left of meter troughs. Each 500 MCM phase conductor is tapped to four 4/0 conductors which feed meter socket terminals. Neutral connector (right photo) is mounted below phase connectors. Black 500 MCM cable with white strip is neutral from service switch. The five 4/0 white conductors pass through each of the five horizontal meter troughs to neutralize inductive effects; the small No. 12 white wires connect to meter socket neutral potential terminal. The four large black cables at the extreme left pass under left meter bank, feed right bank.

large connectors in vertical troughs next to each of the two banks of meters. From these multiple-tap phase connectors, 4/0 conductors were run to the appropriate meter socket terminals. (See accompanyto a typical row of meters.)

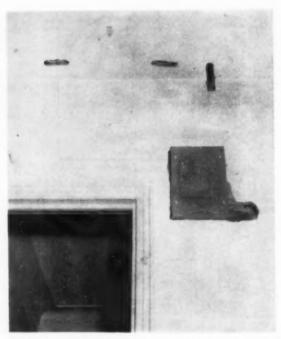
To neutralize inductive effects of the line conductors in the metal trough, a 4/0 neutral was run from the main neutral connector in each vertical trough through each horizontal 5-meter trough, terminating ing diagram showing connections at the neutral busses of the feeder panelboards above the meters. In-

dividual small No. 10 conductors were used to wire the neutral potential connections of each meter socket.

From the load side of the meter sockets, No. 8 conductors were run in vertical troughs to new feeder panelboards above the meters con-



TEMPORARY FEEDS to new risers were connected from old fuse cutouts to new circuit breaker panelboards above meter sockets. Old meter and protective equipment is at right.



CAREFUL INSTALLATION of new apartment panels and branch circuits minimized patching work necessary after the electrical job is finished.

taining two single-pole 40-amp breakers per apartment. Load wiring of the left meter bank was separated from the line wiring of the right bank by a metal barrier.

Existing risers to apartments were fed by the left meter bank; new risers to the 4th, 5th and 6th floors were run from the right bank. Old feeder wiring in the existing conduit was pulled and discarded; new feeders were pulled in the existing conduit to feed only the first three floors. The empty riser conduit above the third floor was abandoned.

New raceway feeding the upper three floors was 1½-in. rigid conduit all the way. This eliminated any confusion and delay in handling two or three sizes of conduit and fittings which would have been probable had the riser been reduced in size at each floor to minimum code requirements.

New circuit breaker panels were installed in each apartment as close as possible to the old 2- or 3-circuit plug fuse cabinets. In many cases it was possible to place the new panel in a closet immediately behind the old cabinet. A knockout was drilled in the back of the old cabinet, a short nipple installed, and the existing No. 14 branch circuit spliced and extended to break-

ers in the new panel with No. 12 wire. The old fuses and cutouts were removed, the old panel being used solely as a splice and pull box.

On the first three floors, the new feeders were pulled in the existing conduit risers right through the old cabinet and into the new panel. On the upper three floors, the new 11-in. riser conduit fed directly into the new panels.

To facilitate pulling conductors into the conduit between the basement and first floor, a single No. 4 neutral was run to the neutral bus of the first floor apartment breaker panel. From this bus, two No. 8's were carried back into the riser to the second and third floors.

The two new 20-amp appliance circuits in each apartment were run to a double duplex receptacle using three No. 12 TW conductors. This was entirely satisfactory, since the receptacles were located over the only counter area available in the kitchen and were thus most accessible for any contemplated appliance use.

The new panels in each apartment have an 8-circuit capacity at 120 volts using standard-size breakers, or 12 circuits using extra-thin breakers available. In most cases, apartments had been wired previously with two No. 14

circuits, although some had three. These existing circuits plus the two new appliance circuits total five at the most, so there is ample room for expansion in the panels to handle future loads.

Where tenants so desired, an air conditioning circuit was run, concealed in the wall, using flexible armored cable to a baseboard receptacle close to the unit, for ready plug connection.

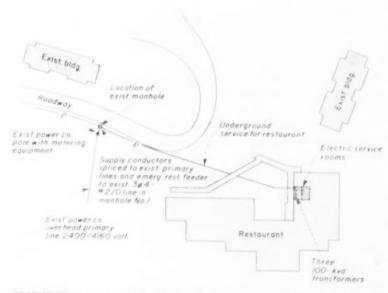
In most cases, very little patching and touch-up work was required in the apartments, due to the care exercised in locating and installing the new panels and in wiring the new branch circuits as shown in the photo above.

To provide for temporary service to the apartments after the new risers had been installed, a 2-wire No. 12 jumper was run from the old 2-wire meters to the load side of the new feeder breakers. Since new feeders to apartments were 3-wire, 120/208 volts, the two hot conductors were temporarily tied together and operated as 3-wire single phase, as shown by the accompanying diagram. The doublepole, 60-amp breakers were left in the open position until the temporary wiring was removed and the permanent system was put into operation.

HIGH VOLTAGE SERVICE

A modern, functional electrical system—supplied from a 4160-volt line—serves power and lighting loads in The Restaurant on the Mountain, Suffern, N. Y. The electrical installation was made by Mehl Electric Company, Pearl River, N. Y.

By George Gianoni, Elect. Engr., Fred S. Dubin Associates Consulting Engineers, New York, N. Y.

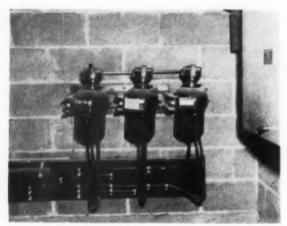


PLOT PLAN of restaurant shows layout of primary service to building. Only two of the many existing motel buildings are indicated here.

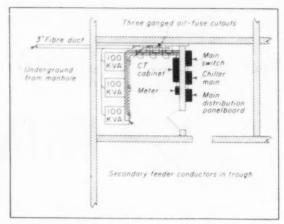
COMPACT electrical system today serves a variety of power and lighting loads in The Restaurant on the Mountain, a building of Japanese design built on the edge of a mountain top in Suffern, N. Y. Here, high voltage supply is transformed to utilization voltage in the basement; distribution throughout the building is modern and direct. And one of the main features of the instalthe overall lighting lation is treatment. Use of a variety of luminaires produces light levels carefully suited to functions and forming an integral part of interior decorations in the building. Design details of the overall system are many and varied.

Power for the restaurant comes into a transformer room on the ground floor of the building. A 4160/2400-volt, 3-phase, 4-wire supply feeder is run underground to this room from a manhole some distance away from the building. The supply to the manhole is made from an adjacent pole into which the utility brings its primary line.

Within the building, the supply feeder is carried to a wall-mounted assembly of oil-filled, loadbreak fused disconnect switches in the transformer room. A single-pole switch is placed in each phase conductor. The switch assembly provides service disconnect means (NEC Sec. 2351), service entrance conductor overcurrent protection (NEC Sec. 2371) and transformer overcurrent protection (NEC Sec. 4512). The assembly consists of three oil-fuse cutouts in a gangoperating rack and mechanism. Each cutout is rated for 5 kv, 100 amps and fused at 50 amps. Interrupting capacity of each cutout is 25,000 kva, offering complete short-



SERVICE DISCONNECT is a load-break switch assembly consisting of three, 5-kv, oil-fuse cutouts mounted on a gang-operating rack mechanism. Units have interrupting capacity to correspond to short-circuit capability of supply line at this point, Equipment grounding conductor is shown just to left of units.



EQUIPMENT LAYOUT in transformer room and adjoining electric room is the heart of the electrical distribution system.



DISTRIBUTION EQUIPMENT — maindistribution panelboard in foreground, chiller main disconnect behind it and main secondary switch at right rear—is mounted as shown on plywood board on wall of electric room. Panelboard is CB type, providing protection and disconnect for each of eight distribution feeders to power and lighting panels throughout building.

From The Job Specs

WIRES AND CABLES

- a. All conductor wire and cable for secondary lighting shall consist of thoroughly tinned 98% conductivity copper, with 600 volt rubbercovered insulation manufactured in strict accordance with the requirements of the Board of Underwriters and the A.I.E.E.
- b. Wires sized #12 and #10 A.W.G., shall be type "R" single braid solid, unless otherwise noted or shown on plans; sizes #8 A.W.G. and larger shall be type "RH" double braid stranded. Wires underground shall be "RHW" in galvanized conduit.
- c. No wire smaller than #12 A.W.G. shall be used for any branch circuit unless noted on plans for special system circuits. Larger sizes shall be used where so indicated on the plans.
- d. All wire shall be color coded.

RIGID STEEL CONDUIT

c. Rigid steel conduit shall be used in all exposed locations where subjected to mechanical injury, when buried in the floor slabs or earth or when the size of conduit does not permit the use of thin-wall. All conduits when located in outside walls or underground shall have all joints "red leaded."

ARMORED CABLE AND THINWALL TUBING

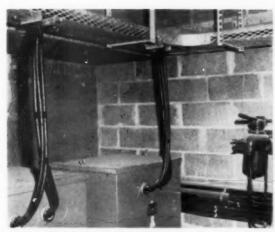
- a. Armored cable shall be used for all concealed branch circuit lighting wiring except for "home runs" to panels and exposed work in Mechanical Equipment Rooms, which shall be thinwall tubing. Armored cable shall also be used for short connections to fractional horsepower utility motors."
- c. Thinwall tubing shall be used for all lighting circuit "home runs", all exposed work in mechanical spaces, and in all other places where permitted by code for all conduit sizes up to and including 2 inch."

circuit protection to the service.

The primary service feeder consists of three No. 4 conductors with an oil-base, ozone-resistant insulation rated for 5 kv service and one No. 4 bare copper conductor. The conductors are run in a 3-in. fiber conduit from the manhole into the transformer room, where the insulated conductors are terminated in potheads on the oil fuse cutouts. From the load side of the cutouts.

the three insulated phase conductors are carried with the bare grounded neutral to the transformer primary terminals. Details of the cable arrangement are shown in illustrations.

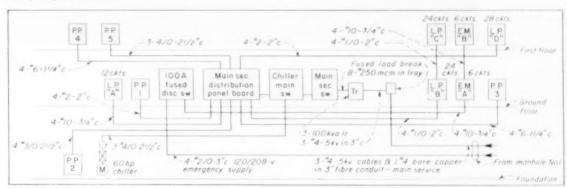
As part of the electrical installation, an equipment grounding system was installed in the transformer room. This was designed to provide a permanent and effective bonding together and grounding of all non-current-carrying parts of equipment in the transformer room—transformer enclosures, pull boxes, conduit, cable trays, etc. Made electrodes were used for grounding the system equipment and for grounding of the transformer secondary neutral conductor. A ½-in. by 2-in. copper ground bus in the room is mounted ½-in. out from the wall and 6 in. above the floor. Connections to the



SECONDARY FEEDERS from transformer bank are carried up into cable tray as shown. Each phase and each neutral consists of two 250MCM, type RH conductors in multiple. The neutrals are spliced in the trough into one two-conductor neutral. A total of eight 250MCM conductors make up the three-phase, 4-wire feeder.



CABLE TROUGH, coming from the transformers at left, carries secondary conductors to metering equipment shown on wall and through wall to main switch on opposite side.



RISER DIAGRAM of overall power and lighting distribution system points up substantial loads throughout the restaurant. Emergency supply and panels are also shown.

TYPICAL PANELBOARDS are shown here. At left, power panel serving wide range of power equipment in kitchen and bakery areas has fused pull-out type circuit protective devices. This is P.P.-1 on the riser diagram. It supplies cooking and refrigerating equipment and food preparation machines. At right is a typical CB panelboard for lighting and appliance loads. This is a 28-circuit panel, with 21 active circuits, I-spare circuit and 6 blanks for future circuits.

ground bus from the equipment and to ground electrodes are made with No. 4 bare copper wire. Grounding conductors are attached to the ground bus and to conduit, circuits, cabinets, equipment and ground rods by means of pressure type connectors.

The transformer bank consists of three 100-kva, single-phase transformers connected primary-wye and secondary wye to transform







EXTERIOR LIGHTING enhances the charm of the Japanese-style construction. Cube-shaped lanterns and surface mounted floodlights illuminate the outside deck walks around the side of the building which hangs out over the rocky mountain-side. This lighting is also part of the interior lighting effect because of the all glass walls. And from the highway below, the restaurant stands out in an eye-catching glow against the black background of the sky and mountain.

4160/2400-volts, 3-phase, 4-wire to 120/208 volts, 3-phase, 4-wire. The transformers are dry-type self- supporting units. The primary winding of each transformer has two 24% taps above and two 24% taps below normal voltage.

Power at secondary voltage is carried from the transformers by eight 250 MCM conductors in cable trough. As shown in photos, this trough runs to a junction box on a wall which separates the transformer room from an adjoining

room containing the distribution switching and protective equipment. The secondary conductors are carried through the concrete-block wall into the back of a main secondary switch on the other side of the wall.

Distribution equipment and layout are shown in illustrations. The main switch is a 4-pole, 3-fuse and solid neutral, unit rated for 1,200 amps and fused at 850 amps. This heavy duty, 240-volt ac switch is externally operable and has a quick make, quick break positive action mechanism, with an interlocking cover that cannot be opened with the switch in the closed position.

The restaurant itself is associated with a group of motel units known as the "Motel on the Mountain". From the electric supply to the motel, a secondary voltage emergency supply is run to the restaurant building to provide essential power to the restaurant in the event of outage of its own transformers or supply. This emergency feeder is carried to a fused disconnect in the ground floor electric room.

Installation of the overall electrical system in the restaurant was made by Mehl Electric Co., Pearl River, N. Y.



BASIC FIXTURE in the decorative outside lighting is this cube-shaped unit with translucent glass side and concentric louvers in the solid bottom. The unit conductors to the unit are carried in grooved top edge of rafter.



TYPICAL FLOODLIGHTS mounted around exterior of building at three levels are double-bracket, cone housings—each containing a 60-watt incandescent lamp. Conduit carrying branch-circuit conductors is concealed in furred space over the glass wall.

Operating Costs — Establish Experience Overhead Figures

By Ray Ashley, Research and Consulting Engineer, Oak Park, III.

QUESTION:

Can a contractor base his overhead costs on figures supplied by others?

ANSWER:

No. Such costs must be based on his own experience.

SURVEYS OF OVERHEAD COSTS

Values from seven early surveys showing percentages of the total job costs

Item of Cost	Percentage Min.	Reported Max.
Administrative salaries	6.5	12.
Salaries of office employees	8.85	17.5
Rents	1.2	3.5
Advertising	0.2	1.1
Light and heat	0.12	1.3
Taxes		0.93
All other expenses	10.3	16.8

FIG. 1—Wide Variation in survey figures show hazard of using overhead figures supplied by others. Each contractor should establish his own costs based on his specific type of operation.

DISCUSSION:

A contractor must use overhead values based on studies of his own business operation. Overhead costs vary according to the type and size of projects, annual volume of business, management techniques, and many other factors not uniform for all contractors.

The wide variation in values shown in Fig. 1, indicate how hazardous it would be for a contractor to use values established by surveys. There is approximately 100% variation between the minimum and maximum value for each item of cost listed.

A careful analysis of a business should not require more than 3% or 4% for miscellane-

ous expenses. Fig. 1 has from 10.3% to 16.8% for "all other expenses". The accuracy in reporting some of the costs might be questioned. But, the amounts for rent, heat and light should be correct. The wide gap between the reported amounts for these items shows how far from a uniform figure contractors' experienced costs can be.

When studying the results of surveys, one has no guarantee that those supplying the information were in position to report properly. Besides, there are certain costs, such as general supervision and estimating, that are close to the line and there is no uniform practice for assigning

them to direct job costs and overhead.

Take for example, a "oneman" business where the proprietor manages the business, estimates and engineers the jobs and superintends the work. In reporting, he might include his entire salary as overhead, whereas, engineering, superintending and other items of cost belonged to direct job expenses.

Although each contractor must study his own costs, much can be gained by conferring with others. However, for such conferences to be beneficial, each contractor must explain in detail his understanding of overhead and what items he includes.

Silent Sound As Protection Device...

at Peoria, III., jewelry store. Components saturate area with ultrasonic waves which trigger alarm when disturbed. Installation by Protection Alarms, Inc., a division of Oberlander Electric, Peoria electrical contractor.

By R. E. Rives, Operations Manager, Protection Alarms, Inc., Peoria, III.

NILENT sound, in the form of ultrasonic 19,200-cycle waves traveling 1130 ft per second, provides effective prowler detection throughout the interior of a Peoria, III., jewelry store. Existence of the protection system is unknown to all but the informed since the high pitch of the sound waves is inaudible to the average human ear. The system was installed by Protective Alarms, Inc., division of Oberlander Electric, for the specific purpose of detecting or "scaring away" burglars who might hide in the store after closing time. When

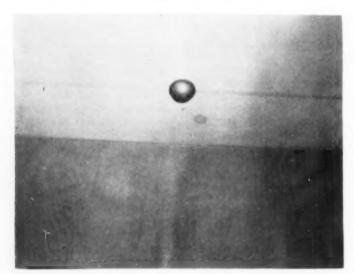
the system is turned on, any movement within the store changes the frequency of the "picked-up" ultrasonic waves and triggers an alarm.

The basic system, manufactured by Walter Kidde & Co., Inc., includes a transmitter, receiver or pickup, master control or "electric brain", and monitor. The transmitter, ceiling-mounted at the rear of the store, is enclosed in a small metal case about the size of half a grapefruit. It emits the ultrasonic sound waves. Near the front of the store, about 40 ft away, is another half-grapefruit-shaped metal case

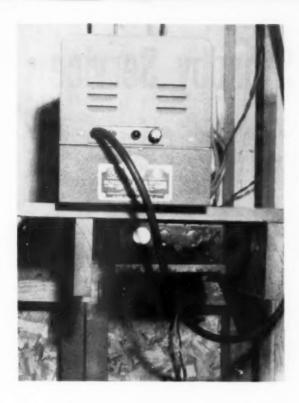
housing the receiver. This picks up and listens continuously to the sound waves being transmitted. It "hears" not only the transmitted sound, but also the "echoes" bouncing off the walls, furniture and any other object in the room.

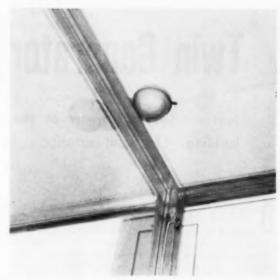
As long as the reflected sound waves come from stationary objects, all sound picked up by the receiver will be on the same "note"-19,200 vibrations per second-emitted by the transmitter. If there is any movement within the area scanned by the ultrasonic sound, reflected waves of a different frequency (higher or lower than the original) will reach the receiver. When this happens, the master control, to which both transmitter and receiver are connected, senses the difference in the two notes and sends a signal to the monitor panel or may flash a light, ring a bell or operate a warn-

In this installation, the master control (about the size of a portable radio) is out of sight in the "attic" of the store. This unit acts as the "brains" of the system and features a comparison circuit which matches the transmitted note with that received by the pickup. Should the two differ, an alarm relay sends a signal to a monitor in Protection Alarms' central station signifying unauthorized persons are in the store, In cases where no central station facilities exist, the alarm circuit can control conventional burglar alarms such as lights, bells



TRANSMITTER installed towards rear of store sends out high frequency waves at the rate of 19,200 per second.





RECEIVER located in front of store listens to sound being transmitted by its partner. All sound is on the same note as long as nothing it strikes is moving.

MASTER CONTROL UNIT or "electric brain" installed in attic matches notes transmitted with those received. When they differ, alarm device is set off.

Included in the master control unit is a sensitivity adjustment by which the system can be tuned to meet the requirements of the protected area. Thus, false alarms, triggered by strong air currents or animals or rodents within the area, can be prevented. Any interruption of current in the system circuit will

always sound an alarm. A toggle switch on the monitor panel provides a simple means of checking system operation. Regulators within the master control unit prevent false alarms due to current fluctuations. These allow normal operation when the power source varies between 90 and 130 volts and 59 and

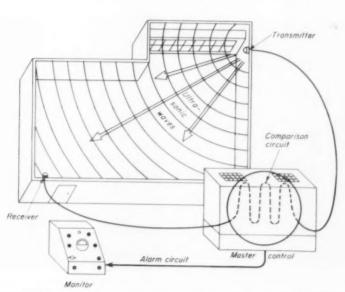
61 cycles. Normal rating of the equipment is 110 volts, 60 cycles and the load is no more than that required by a single light bulb.

Size and character of the space to be protected must be known before the amount of protection equipment can be determined. Generally speaking the basic set will protect an area of 4000 sq ft or a volume of 60,000 cu ft. Area design or the sound absorbing characteristics of its contents may reduce this coverage somewhat.

Oberland's Protection Alarm Inc. surveys the premises, determines the amount of equipment needed for adequate protection, and installs the system. The equipment is not sold to the customer, but leased on a monthly basis (rate) which includes service and maintenance.

In addition to burglar detection systems, the firm also provides services for closed-circuit television, sprinkler supervision, freezer and refrigerator supervision, industrial process supervision, opening and closing supervision and fire detection.

The ultrasonic installation in the jewelry store has more than paid for itself. Over and above the protection afforded by the system, the jewelry store owner has been able to offset monthly rental charges by a reduction in annual insurance premiums.



ULTRASONIC waves scan entire room, while master control unit compares notes sent out by transmitter with those picked-up by receiver. Should they vary because of movement in the room, the alarm relay goes into action.

Twin Generator Standby Service

features load selectivity at the new Kohler, Wis., school-community building. Electrical installation by Mayr Electric Co. of Sheboygan.

UAL generators in the standby electrical system assure continuity of night-time school or civic functions during a power outage at the new Kohler Memorial building in Kohler, Wis. The emergency system was designed so one generator handles the emergency lighting while the other, through selective switching, provides normal electric service to a 1.200-seat auditorium, or a gymnasium, or an indoor-outdoor swimming pool. The building, a joint project of the trustees of the Kohler Memorial Fund, Kohler village and the school district, also contains a youth center and additional class-

Two 35-kw, remote control, Kohler electric plants in the building basement comprise the heart of the standby system. Both generators are gas-driven to eliminate the need for fuel tanks, have automatic starting, and are cooled by city water. If the power supply should fail, one plant automatically handles the normal emergency lighting system; the other handles manually-switched selective loads serving areas of the building in use at the time.

Normal service to the emergency lighting circuits is through a feeder originating at the main switch-board bus on the line side of the main circuit breaker and terminating at one side of an automatic transfer switch. The normally-closed operating position of this switch maintains circuit continuity with the main switchboard so the emergency circuits remain energized even though trouble occurs on the load side of the main breaker.

Should an outage occur on the

incoming service to the main switchboard (line side of the main circuit breaker) both standby plants are started automatically. At the same time, the emergency transfer switch shifts the emergency circuit load to generator No. 1. This consists of building emergency lighting, site lighting, panic lighting and emergency power for heating the building.

In the interim generator No. 2, which started simultaneously with generator No. 1, runs under no-load conditions until maintenance personnel adds a selective load. This may be full lighting for the auditorium, gym or swimming pool, whichever is in use at the time.

Use Key Interlock

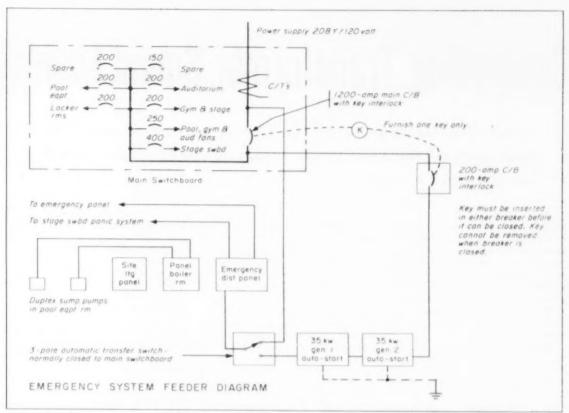
Manual transfer of this added load is accomplished from the main



DUAL 35 KW standby generator plants in boiler room adjacent to main switchboard room. Both are gas driven, have automatic starting and are cooled by city water. One plant serves emergency lighting, including site lighting, panic lighting and emergency heating power. The other generator runs no-load until its load is manually selected by maintenance personnel.



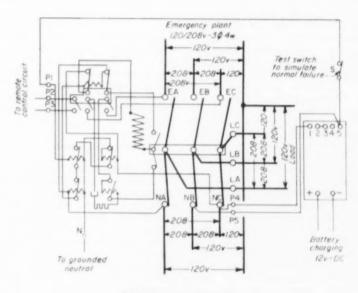
MANUAL TRANSFER of normal load to generator No. 2 is made at main switchboard after opening main breaker and closing standby feeder breaker Load is chosen on basis of greatest need.



ONE LINE DIAGRAM of emergency electrical system at Kohler Memorial building. Standby generator No. 1 handles normal emergency circuits generator No. 2, selected loads from main switchboard through key-interlack breakers.

switchboard through the key-interlock features of two circuit breakers. One is the main breaker on the board; the other a circuit breaker in the feeder originating at generator No. 2 and terminating at the switchboard bus on the load side of the main breaker. Only one key is furnished to maintenance personnel. This must be inserted in either breaker before the breaker can be closed. And the key cannot be removed when the breaker is in the closed position. This prevents the possibility of having both breakers closed simultaneously.

Once the breakers have been set, and generator No. 2 is feeding the main switchboard, selective load can be added to the standby unit by resetting the proper breaker on the main board. Thus, a play, community assembly, basketball game, or swimming meet need not be interrupted or cancelled because of a power shortage. Careful electrical system design and installation of dual standby generators assure adequate emergency power when needed.



EMERGENCY TRANSFER SWITCH CONNECTIONS

Looking at connections from front of switch panel with normal power source energized

AUTOMATIC TRANSFER switch connections for the 120/208-volt, 3-phase, 4-wire lighting and power system.

Controlling Transformer Sound Levels

Consideration should be given to the location and arrangement of the space which will house transformers to keep the sound perception of such equipment to a minimum.

T IS common practice to locate transformers near the area of maximum load in order to obtain, by short cable runs, minimum voltage regulation at the operating equipment. Because dry-type transformers minimize the possibilities of fire and explosion, they are particularly adaptable to building installation.

Transformers, pumps, motors, and air conditioning equipment are frequently placed in the same room or in adjacent rooms and at times it is necessary to have ventilating ducts pass through transformer rooms on the way to nearby auditoriums, classrooms, or hospital rooms. Even though the transformers are relatively quiet, conditions may exist near the equipment which will amplify their normal 120-cycle hum. Therefore it is important that consideration be given to the reduction of amplitude and to the absorption of energy at this frequency.

Transmission of Sound

Sound vibrations originating from any source reach the listener's ear by transmission through the air. Air-borne sounds are carried directly to the listener's ear whereas structure-borne vibrations may be conducted to a place where conversion to air-borne vibrations or sound is objectionable. It is of equal importance to reduce these conducted vibrations as it is to keep air-borne sounds to a minimum. In some instances, the sound heard is a combination of transmission through the air and through a building wall. Some reduction or attenuation of sound waves takes place through building walls. The remainder, being reflected in various directions, may result in an increase of sound level

to a value higher than the source level.

A relatively high sound level in the equipment room does not necessarily mean an abnormal condition within the apparatus. However, absorption devices may be necessary if sound originating in an unoccupied equipment room is objectionable outside the room, particularly if there is a "build-up" of sound due to reflections.

Many materials are available which act as absorbers of sound. These are usually porous materials of vegetable or mineral fibers, hair 'mineral aggregates acoustical surface plasters which will receive sound energy and transform part of it into heat. The part turned into heat produces negligible temperatures. Structureborne sounds, with which one is often concerned, and which may be increased by room resonance, are usually transmitted from substations, transformers, and units through ducts, housings and doors to adjoining rooms and through floors to rooms below or above the vaults.

Area Consideration

In determining permissible sound levels within a building, it is necessary to consider how the rooms are to be used and what sound levels may be objectionable to occupants of the building. The sound level values given in Table I are representative average values, and they may be used only as a guide in determining suitable levels in buildings because sensitivity of people varies considerably.

Table I		
Quiet office	40	db_{m}
Residence without radio	53	
Residence with radio	60	
Large store	61	

Conversation .						,	,			60	db_{m}
Small office		0					p		4	53	
Medium office		(ş	ŧ	()			1	0		
desks)			,						0	58	
Large office										64	
Factory office										61	
Average office										70	
Average street										80	

Other locations, where low sound levels are of more importance, are shown in Table II. Particular care should be exercised in locating transformers and in the design of buildings to effect sound levels suitable to all occupants.

able to all occupants.		
Table II		
Radio, recording, and		
television	25-30	db,
Theatres and music		
rooms	30-35	
Hospitals, auditoriums		
and churches	35 - 40	
Classrooms and lecture		
rooms	35-40	
Apartments and hotels.		
Private offices and con-		
ference rooms	40 - 45	
Store	45-55	

To obtain suitable sound levels, consideration should be given to the distance from the source of the sound to the rooms under consideration. The loss of energy or the decease in sound level varies at an approximate rate of six decibels for each doubling of the distance from the source of sound to the listener. For example, if the level 6 ft from the transformer is 50 db, the level at a distance of 12 ft would be 44 db and at 24 ft, the level decreases to 38 db, etc. However, this rule applies only to equipment in large areas equivalent to an out-of-door installation.

Transformer Sound Levels

Transformers emit a continuous 120 cycle hum with harmonics when connected to 60 cycle cir-

in Buildings

By H. S. Gates,

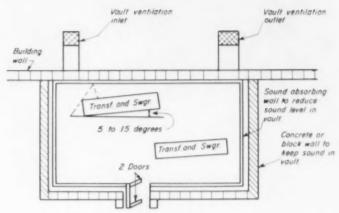
Network and Power Transformer Engineering Westinghouse Electric Corporation, Sharon, Pa.

cuits. The fundamental frequency is the "hum" which annoys people primarily because of its continuous nature. The higher frequencies are usually less noticeable because of their lower energy level. The loudness of a sound is determined from an equally loud pure 1000 cycle tone. The sound level meter, by the use of various frequency weighting networks, indicates approximately the loudness level of sounds. For transformer sound. for purposes of standardization. only the A or db, network is used. Transformer sound levels as recommended by the National Electrical Manufacturers Association for ratings through 3000 kva are listed in Table III.

	Table III	
	Class AA-	-Dry Type
	Self Cooled	Forced Air Coole
0-300	66	70
301-500	68	71
501-700	72	75
701-1000	72	75
1001-1500	74	77
1501-2000	76	79
2001-3000	78	81

Since values given in Table III are in general higher than those given in Table I and II, the difference must be attenuated by distance and by proper use of materials in the design of the building. Recognition must be given also to the possibility of a build-up due to the reflection from walls and other equipment. An observer may believe that a transformer is noisy because the sound level in the room where it is located is high. This may be more noticeable if there is more than one transformer in the room. Two transformers in the same room increase the sound level in the room by approximately 3 db. and three transformers by about 5 db, etc.

Since most transformer installa-



Vault layout to break up direct reflections and standing waves. Door air lock on outside of room

- I Important features
 - A Air conditioning equipment in separate room.
 - B. No building ventilating ducts passing through transf. vaults
 - C. Conduits sealed to walls with sound absorbing material rather than "cemented in"
 - D. Doors of "tight" construction (no air passage around doors).
 - E. Ventilating ducts lined or baffled if opening on to quiet street or area way.

TRANSFORMER room layout to break up reflection and absorb sound.

tions are affected by sound reflections, there is a resulting build-up which has a characteristic depending on the surface area of the transformers as compared to the inside surface of the room. In a very large room, the build-up may be near zero. For larger transformers in comparatively small rooms, where the absorption in the walls is poor, the sound build-up may be as much as 20 db. For example, if the transformer level as measured at the factory under near perfect conditions, is 60 db, and the build-up at installation is 20 db, then the measured level in the room will be about 80 db. Depending upon the location, a level of this order may be too high to prevent an undesirable level in an adjoining room, particularly if there is a free path for sound to escape.

Sounds due to structure transmitted vibrations originating from transformers are lowered mounting the transformers on vibration dampeners or isolators. There are a number of different sound vibration isolating materials which may be used with good results. Dry type power transformers are often built with an isolator mounted between the transformer support and case members. The natural period of the core and coil structure when mounted on vibration dampeners is about 10% of the fundamental frequency. The reduction in the transmitted vibration is approximately 98%. If the floor or beams beneath the transformer are light and flexible, the isolator must be softer or have improved characteristics in order to keep the transmitted vibrations to a minimum. The building structure will assist the dampeners if the transformer is mounted above heavy floor timbers or if mounted on a heavy floor slab.

Transformer Design

Present day transformers are designed to meet NEMA noise levels in Table III, however, transformer manufacturers are continuously striving through their research engineers to lower existing sound levels. At present, certain vibrations are unavoidable, but are minimized by designing the natural period of the apparatus sufficiently remote from the fundamental frequency.

The sound levels given in Table III represent the economical level with present day materials and design techniques. Lower transformer noise levels may be specified, but the cost of the transformer will increase accordingly, and the higher cost must be evaluated against the cost of insulating the equipment room to obtain the



TRANSFORMERS in buildings require proper location and installation to keep sound perception at an acceptable level,

desired results. In some instances a combination of lower-than-standard-sound-level transformer and insulating the area may be the answer.

The larger dry type transformers are shipped with vibration dampeners supporting the weight of the core and coils. The full benefits of the dampeners are obtainable at installation by removing the auxiliary shipping members between the core and coil structure and the case and by use of flexible, current-carrying connectors between the transformer core structure and other apparatus. such as switchgear or metal enclosed bus. These measures may reduce the level of structure-borne sound by 3 to 5 decibels and will frequently eliminate transmission of objectionable vibration to other parts of the building.

Equipment Room

The equipment room walls may be of concrete block, which is an excellent sound insulator. However, doors must be tightly sealed as sound will leak out through cracks. Doors may be sealed with weather-stripping or by other equivalent methods. Double doors or two doors located six or more inches apart will provide attenuation of 10 to 15 decibels more than for one door.

Suggested effective methods for obtaining low levels within the electric equipment room are:

1. The room may be plastered with ½-in. thick acoustical plaster.

2. An inner wall may be built consisting of a 2 by 4 wood studs staggered between the studs for the outer wall, and covered with metal lath and 7-in. gypsum plaster. According to the National

Bureau of Standards, the transmission loss of this wall is approximately 44 db...

 An alternate method is to use wood studs with metal lath and three coats of plaster on each side. Transmission loss is 29 db at 128 cycles.

4. A more efficient wall is one consisting of two steel study of \$\frac{3}{2}\$-in. channels $5\frac{1}{2}$ -in. apart, face to face, with expanded metal lath and gypsum plaster on both sides for a transmission loss of 51 db, at 128 cycles.

Ventilating Ducts

Ventilating ducts are important because an unlined duct will carry sound vibrations with little attenuation. For instance, a duct 24 in. by 24 in. by 60 ft long with three elbows would have a sound level reduction of about 3 db over the 60 ft of length and 1 to 2 db for each elbow, for a total of 6 to 9 db. Acoustical lining is indicated for the inside of the duct or possibly the inside and the outside. Reduction in sound transmission through a duct varies by a ratio of perimeter in inches divided by area in square inches times a constant which depends on the coefficient of absorption of the acoustical lining material. Assuming a common coefficient of absorption of .30 per ft for a 24-in.-sq duct, we have an absorption of .6 db per ft of length, giving a total of 36 db (60 x .6). This is sufficient to provide a solution to the problem of obtaining an attenuation of 36 db.

Since the above has provided attenuation for doors, walls and ventilating ducts, we may consider that the treatment of the installation is sufficient to give the desired results.

General Consideration

There are a number of points which may be considered when designing buildings in order to obtain specific results. They are listed below for ready reference:

1. Rigid connections between the core structure and the transformer case are undesirable when dampener mountings are provided between the core structure and the case.

2. When no vibration dampener mountings are provided, no part of the transformer housing should rest directly against steel members of the building structure.

3. The transformer room and other rooms should not be directly connected with air ducts or ventilated by the same duct system, unless steps are taken to keep the transformer housing isolated from the ducts. Entrance of the sound into a duct can frequently be blocked by installing an absorbent barrier over the vault opening and at a sufficient distance to allow air passage. The barrier should be 12 in. larger than the opening in both directions and covered with acoustical absorbing material. The opening in the wall to the duct should be encircled with acoustical material to a distance 12 in. from the open area.

4. The position of doors and windows should be carefully planned so as to be as far as possible from windows in adjacent rooms where sound levels are to be kept low. For good sound insulation, the windows and doors must fit their frames securely.

 Equipment rooms may have their opposite walls out of parallelism or the equipment in the room, if rectangular in shape, may be installed slightly askew.

Summary

An installation may be designed and built to suitable sound levels. Some equipment is rather large and bulky and because of its size becomes a major source of sound. Invariably, manufacturers of electric equipment minimize resonant conditions by the use of stiffeners and dampeners. The architect and the engineer can get excellent results through a study and correlation of sound levels required together with proper treatment of sound propagation to the enclosing structure.



AUDITORIUM'S THIN-SHELL roof was cast on a shaped hill which was later excavated, leaving the dome supported on previously cast concrete columns. Unusual construction led the way to a unique lighting installation.

Ceiling baffles hold

AUDITORIUM WIRING

Thin-shell cast dome requires electrical installation built around acoustical ceiling baffles in Albuquerque, N. M., civic auditorium.

By Carl R. Albach, Consulting Electrical Engineer

ECAUSE it was begun as a thin-shell roof dome cast over a hill which was then excavated from beneath, the Albuquerque civic auditorium presented a difficult electrical installation problem. The building's 218-ft diameter concrete dome, supported by 22 individual rectangular columns, covers a main arena of 142 ft diameter and a circular balcony with a seating capacity of 3,500. The designers undertook the problem of adequately lighting both arena and balcony while faced with the condition that no conduit could be



MAIN ARENA with a 142-ft diameter concrete floor and balcony seating 3500 occupy entire area under the 218-ft dome. Most of the illumination over the center section comes from lighting units mounted on a baffle supported by steel rods from the dome.

placed in the dome proper because of the latter's unique construction. All conduit, wiring, etc., had to be confined to the columns and intervening curtain walls.

At first, engineers expected that the arena could be lighted by column-mounted floodlights aimed at the dome which would reflect their light to the floor some 50 ft below. However, with columns approxi-

mately 31 ft apart and with no direct lighting from the dome, calculations showed that a sufficient number of floods could not have been placed on the columns to insure uniform illumination at floor level

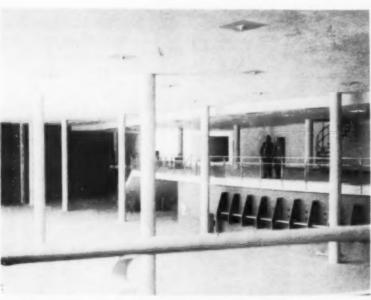
While various types of indirect lighting were being explored, sound engineers studying the auditorium's acoustical properties specified the suspension of two large acoustical baffles from the dome. The larger of these baffles is a 164-ft diameter disc hung from the dome by steel rods. Eight 20-ft diameter apertures, uniformly spaced a distance of 47 ft from the center, and a 50-ft diameter center opening are cut in this baffle. The second baffle, a disc 4 ft larger in diameter than the center aperture in the 164-ft baffle, hangs 7 ft above the large baffle and includes a

9 ft opening at the center. Although these baffles were installed mainly as a means of acoustically treating the auditorium, they solved the lighting problem by also providing support for downlights, lighting switchboard, two dimmer boards, sound console, speakers, air diffusers, and stage lighting plugs.

To provide downlighting for the arena, three concentric rows of 24 high-bay, aluminum type reflectors with 750-watt lamps were

recessed into the lower baffle. The outer row was uniformly spaced on a 76-ft radius, directly above the front rows of balcony seats; the middle row spaced 57 ft from the center; and the inner row 30 ft from the center. 16 1500-watt high bay units were hung in the center opening of the upper baffle and were supplemented by four 1000-watt high bay units recessed at quarter points of the upper baffle.

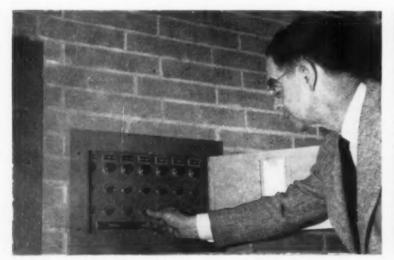
The three rows of 750-watt fix-



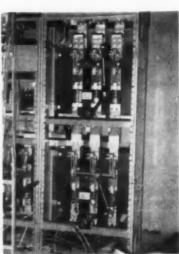
LARGE ENTRANCE LOBBY and small theater alcove are lighted with silver bowl louvered flush mounted fixtures on 12-ft centers.



750-WATT FIXTURES of outer row are recessed into lower accountical baffle alternately with air diffusers.



COMPACT REMOTE CONTROL pushbutton panel in manager's office controls column and cove lighting, outer ring lights of lower baffle, exit and emergency lights as well as parking floodlights. Pilot lamps indicate areas lighted.



AT MAIN STATION, switches with high interrupting capacity fuses control feeders to smaller substations.

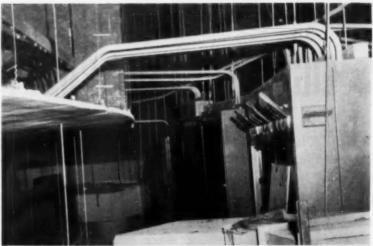
tures, the four 100-watt fixtures, and the center four 1500-watt units of the 16-unit group are all wired to an electrically operated dimmer board on the lower baffle. To provide some lighting over the floor area without having to climb to the lower baffle dimmer board to turn on these lights, the outer ring of 750-watt lamps can also be controlled from an office on the building's south side and from the electrical equipment room on the north side. Total lighting from the baffles supplies an illumination level of 10 footcandles over the front part of the balcony, increasing to approximately 30 footcandles at the center of the arena.

The balcony seating area is illuminated by five ventilated, adjustable fixtures mounted on each of the 22-dome supporting columns. 300-watt mogul base, inside frosted lamps are used in these fixtures. The settings required point by point calculations. To supplement this group of column lights, a row of units, consisting of two 300watt fixtures each, were recessed in a cove over the back rows of balcony seats. In addition, seven single 40-watt strip lights with asymmetrical reflectors were concealed behind a parapet at the base of windows located directly under the dome's lower edge; at night, these lamps light the smooth periphery section of the dome and simulate daytime window light.

After considerable study of first cost and efficiency of eight different fixtures, including straight incandescent lamps, 4 ft by 4 ft fluorescent, 6 ft domes with 750-watt incandescent lamps, and a 75-in. diameter fluorescent fixture, one type of lighting was finally chosen for the 60- by 162-ft main lobby area for a private meeting room area which extends to the southeast corner of the main lobby. This was a 500-watt silver bowl lamp recessed in Silvray fixtures, which combined low cost with high efficiency.

Underground Supply

Power for the building is supplied by a 2400/4160-volt, 3-phase, 4-wire primary service brought underground into a transformer vault on the ground floor at the north side of the building. Here, three 250-kva transformers step the voltage down to 120/208 volts,



MANUAL AND ELECTRICALLY operated dimmer boards are supported from dome by steel rods. Conduit extends from the cabinets to the upper acoustical baffle where the large 1500-and 1000-watt high bay units are located.





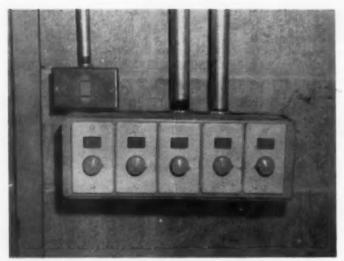
AUTHOR INSPECTS one of the 750-watt recessed fixtures a few feet away from one of the 20-ft apertures used for additional stage lighting. Three concentric rows of these fixtures ring the auditorium.

3-phase, 4-wire. A 2500-amp secondary feeder bus duct extends from the vault to load center No. 1 in the adjacent electrical equipment room. Center No. 1 contains four main fused switches: a 1000amp switch for itself, a 1600-amp switch for load center No. 2, an 800-amp switch for center No. 3, and a 30-amp switch for the exit panel. Nine feeder breakers, four branch circuit panels, and six remote control contactors are included in this load center, which handles general lighting and power circuits as well as balcony lighting on the north half of the building. Load center No. 2 in the south balcony area handles the lighting and power for offices, meeting room, box office, and south half of the balcony. The mechanical equipment room above the main lobby houses load center No. 3, which contains a local lighting panel and protection for the equipment room motors. An 800-amp fused switch in this center controls feeders to load center No. 4 on the acoustical baffle. This latter center has two panels and feeder breakers controlling the automatic and manual dimmer boards.

K. L. Conwell Electric Company of Albuquerque, N. M., handled the electrical installation.

LIGHTING CONTROL FLEXIBILITY

is effected by more than 100 remote switches. Low-voltage system installed by Peru Electric Co., for Carus Chemical Company in LaSalle, III.



MASTER CONTROL PANEL located in maintenance engineering office includes five 9-station master selector switches. From this point all lighting throughout entire building is controlled.

ORE than 100 individual lowvoltage switches plus five 9-station master units provide unique multiple and master control of the lighting in Carus Chemical Company's new 65-ft by 110-ft 2-story engineering maintenance building in LaSalle, Ill. Because specific areas demanded both individual and group control facilities, management made flexibility a prerequisite of the lighting design. Peru Electric Company provided it by installing a Bryant 24-volt, multi-control system adapted to the requirements at hand.

In the basement of the new structure are the storage and stock room areas. The main floor houses the maintenance shop and maintenance engineering office. The second floor is partitioned into drafting rooms, conference rooms, library and nu-

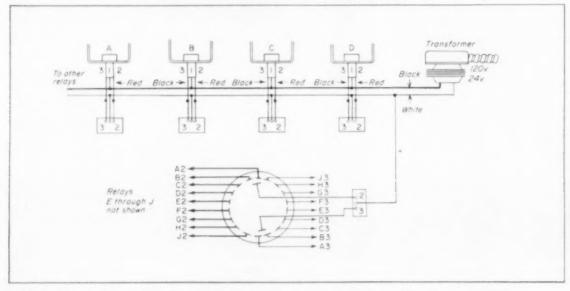


DIAGRAM of low-voltage master selector switch that is used to control building's lighting.

merous small offices. Slab construction for the building consists of Flex-i-core pre-cast concrete sections whose continuous cells provide the raceway for low-voltage control circuits. Rigid conduit nipples connect lighting fixtures with these cells and rigid conduit drops carry the control circuits to surface-type, wall-mounted switch boxes.

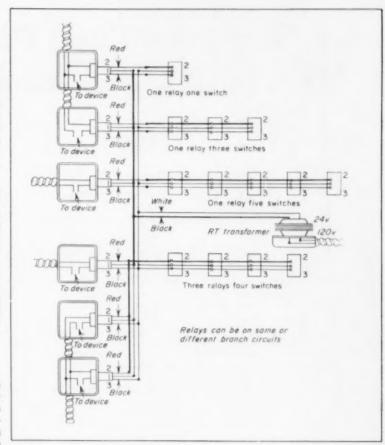
A total of 50 relays, mounted in hinged-covered and screw-covered boxes, control all lighting circuits in the building. Relay groups are strategically spotted throughout the structure to minimize runs to fixtures. Small transformers, in similar enclosures, provide 24 volts for multi-control. Even the perimeter lighting over work benches and machines in the shop area, as well as general lighting, is controlled by the low-voltage system.

Copper Savings

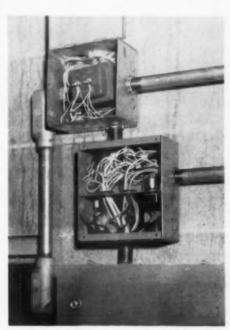
Considerable copper \$\(\epsilon\) conomy was effected by the extensive use of 2-and 3-conductor 24-volt cables, plus 19-conductor cables from the master switches to relay boxes. System design is such that future switches and control circuits can be added with minimum trouble and expense. Overall switch-loop line losses are minimized also.

Biggest advantage, over and above the copper economy, is the convenience to personnel. The multi-control, low-voltage system was designed to enable personnel to literally provide a "path of light" through any portion of the building. The substantial number of conveniently located switches eliminated back-tracking to turn lights "on" or "off". And the push-type switches, with their positive "on" and "off" positions are easy to operate. Even if area lights had been turned off at the master control center, a slight pressure on the local switch "bar" will turn them on again.

The possibility of any lights being inadvertently left burning all night is nil. All five of the 9-position master control units are ganged in a single switch box in the chief engineer's office. At the end of each working day, he simply turns five knobs to extinguish all lighting in the building.



CIRCUIT SCHEMATIC of possible relay and switch arrangements.



24-VOLT TRANSFORMERS and relay gang boxes are spotted in various sections of the building to minimize wiring runs from relays to fixtures.



SURFACE TYPE low-voltage switch supplied by conduit provides local switching.

Common Code Problem

Disconnects for Motor Control Circuits

Section 4406 of the N. E. Code requires that the disconnect means in a motor branch circuit must disconnect both the motor and its controller from all ungrounded supply conductors. Here's a discussion of the application of that requirement to circuits containing remote control operation of the motor controller.

By B. A. McDonald

T HAS been my experience in the past that some engineers who design control circuits, fail to recognize the provisions of Section 4406. I have at the moment a letter from a very capable design engineer and estimator advising that wiring plans coming from reputable architects fail to recognize this code provision and that many of our electrical inspectors do not observe this violation in the field. He is very much disturbed since he finds it necessary to supplement such wiring diagrams with additional protection-which he feels obligated to do, regardless of the action taken by his competitors,

The basic requirement of section 4406 covers the location of the motor disconnecting means in the motor branch circuit. The rule requires that the disconnect switch or circuit breaker be placed on the

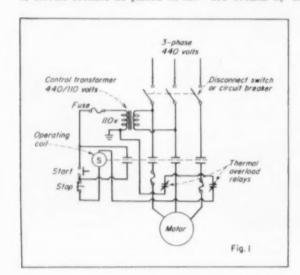
line side of the controller, so that both the controller and the motor can be isolated from the supply by the disconnect means. The rule further requires that the disconnect means must interrupt all ungrounded supply conductors. This differentiates the disconnect from the controller which need not open all ungrounded conductors to the motor, so long as it can effect starting and stopping of the motor. However, where a controller also serves as the disconnect meanssuch as a general purpose switch, a CB or a manual type starter-it must be able to open all ungrounded supply conductors.

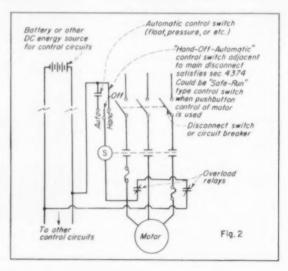
The intent of the disconnect requirement is to make possible safe maintenance by eliminating hazard due to energized conductors. Since all ungrounded supply conductors are broken by the disconnect, the

controller and motor should be completely free from any dangerous potentials. When the disconnect is again reclosed, operation of the controller will determine starting and stopping of the motor.

Although the foregoing covers generally disconnect requirements, questions frequently arise about the application of disconnecting means in motor circuits using magnetic, remote-operated controllers. A close look at the possible hookups of magnetic controllers reveals the variety of hazardous conditions which can prevail.

Fig. 1 shows a typical motor circuit using a disconnect device and a magnetic controller. As shown, the operating coil circuit of the controller is energized from the load side of the disconnect device. In such a circuit, the open disconnect can insure that the control





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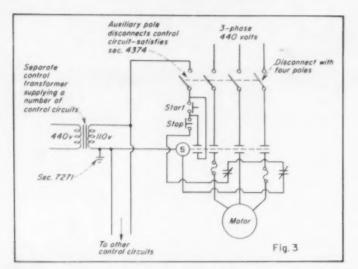
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circuit is dead. And because the controller is equipped with undervoltage protection by means of the holding contacts across the START button, reclosing of the disconnect will always be made with the controller in the open position. To start the motor, the START button must then be pushed. Such a circuit conforms to the code disconnect requirements and provides complete safety to maintenance personnel who work on the controller or motor with the disconnect in the open position.

It is possible, however, for an open disconnect in a motor circuit

to eliminate the hazard of live control conductors without reducing the hazard due to unexpected starting of the motor upon reclosing of the disconnect. Such would be the case in Fig. 1 if a float switch, a pressure switch or a similar maintained-contact, automatic control device were used to close the control circuit to the operating coil, instead of the pushbutton station and holding contacts. In such a case, the motor might not be running when the disconnect is opened, but the control switching device (float switch, or etc.) might close while the disconnect is open. Then when the disconnect is reclosed, the motor will start unexpectedly and possibly do some damage. course, such hazard can be eliminated by proper use of a "SAFE-RUN" or "HAND-OFF-AUTO-MATIC" switch in the control circuit in addition to the automatic

control switch. The control circuit

can then be set in a maintained-

open condition before the discon-

nect is opened. Reclosing of the dis-

connect will not cause unexpected

starting of the motor, regardless of the position of the automatic switch.

Fig. 2 shows a motor circuit hookup which differs from Fig. 1 in a very important way. In Fig. 2, the energy used to operate the actuating coil of the magnetic starter is derived from supply conductors which are not interrupted by the disconnect device which opens supply conductors to the motor itself. Such hookups are common in large, complex, interlocked sequence control systems used in industry. In many cases, energy for operating a number of controller coils is taken from a single control transformer or from a battery system. In such cases, the main disconnect can be opened without de-energizing the control circuit. This presents a hazard to personnel due to possible electric shock and another possible hazard due to unexpected starting of the motor when an open disconnect is reclosed. To properly satisfy the requirements of section 4406, such circuits must also conform to section 4374.

Section 4374 of the NE Code expands on section 4406 as it applies to magnetic controllers with independent sources of control energy.

According to section 4374, a switch would have to be installed in the supply to the control circuit in Fig. 2, preferably located immediately adjacent to the motor disconnecting means. Then the control circuit could be readily de-energized when the motor disconnecting means is in the open position.

In some cases, plant engineers might modify Fig. 2 to conform to section 4374 by adding another pole

to the motor disconnecting means and connecting this pole in series with the control circuit. In that way, the disconnect would open the control circuit when it opens the power conductors. Fig. 3 represents such a modification where control circuit power is independent. If the motor disconnect is opened, it isolates the controller, the control circuit and the motor from all ungrounded conductors. The hookup eliminates the need for use of a control circuit switch adjacent to the motor disconnecting means and does provide a high degree of safety to maintenance workers.

In Fig. 3, the extra pole in the disconnect must be placed in the hot (ungrounded) leg of the 110-volt control circuit and not in the grounded leg. This is essential to eliminate any live terminals in the controller or control circuit. This circuit is grounded in accordance with section 7271, and the position of the grounding is determined by section 4373 (to eliminate accidental starting due to ground faults).

As an alternative to the auxiliary pole in the disconnect in Fig. 3, a separate disconnect switch can be used to de-energize the control circuit which is supplied from a separate source of energy as shown in Fig. 2. In the case of interlocked sequence systems, the control circuits often become complex from the standpoint of code rules. Such circuits should be carefully studied, designed and installed.

It should be noted in Fig. 3, that the use of a momentary-contact START button and holding contacts does represent a control circuit arrangement which will disconnect the control circuit from its source of supply when the main disconnect is open. This would give the same disconnect effect as that of the auxiliary pole in the motor disconnecting means, except that one side of the holding contacts would be hot. This does not meet code requirements for disconnecting the controller from all ungrounded conductors. A live terminal would be present in the controller.

A brief summary of the foregoing indicates that the code, principally on the basis of safety to the maintenance electrician, requires a motor disconnecting means to disconnect the motor, the controller and the control circuit.





Raintight Clampmatic Vacu-Break—a fusible or nonfusible switch completely weather-proof. Ratings from 30 to 200 amps.



Junior Clampmatic Vacu-Break—a high-quality, fusible, general-purpose switch. Ratings range from 30 to 600 amps.

Master Clampmatic Vacu-Break—unequaled for quality, dependability and performance. A fusible or nonfusible heavy-duty disconnect for applications up to 1200 amps.

Profit from these 3 Clampmatic Vacu-Break safety firsts!

Three exclusive safety firsts are the mark of all BullDog switches. They assure top performance . . . bring extra protection and longer life . . . bring you customer satisfaction, repeat business.

Vacu-Break® arc control, for one, smothers arcs instantly . . . minimizes burning and pitting. Unique Clampmatic® action provides bolt-tight contact pressure. And the dependable BullDog switch mechanism guarantees positive switching.

In every way—for any switch application, one of BullDog's big 3 safety switches will meet virtually any customer requirement. For complete details see your distributor, BullDog field engineer or write us direct.

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A DIVISION OF I-T-E CIRCUIT BREAKER COMPANY



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Ready for immediate installation.



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Prevents bar from slipping apart accidentally. Permits separation of bar if desired.

SELF-GAUGING



SHALLOW OFFSET

Place gauging lug against edge of rafter or joist and nail in place.



DEEP OFFSET

Straighten gauging lug and line up flush with edge of rafter or joist.

VEXTRA STRONG

THE ONLY BAR ON THE MARKET WITH

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RACO Adjustable Bars have been vastly improved. Note these extra advantages... pre-assembled serrated nails for easy installing... self-gauging lugs for fast positioning... friction stop-lock that prevents bars from accidentally slipping apart. High quality electro-galvanized finish. Write today for new bulletin describing these superior Raco Adjustable Bars.



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ALL-STEEL EQUIPMENT INC. Aurora, Illinois

Motor Shops



Handy Undercutter For Commutators

A shop-made commutator undercutter has added speed, ease and efficiency to undercutting operations at Eisenhardt Electric Motor Repair, Pennsauken, N. J.

As shown in the photo, the undercutter unit is simply constructed from angle iron and some odd pieces of metal. The unit has a sheet steel base to which a 16-in. angle iron arm is attached in the vertical position. This vertical arm supports a sliding block-and-rod assembly which permits moving the block up or down to any position along the rod, with a set screw to fix the block in any position. The undercutter motor unit is mounted on the end of a double bar extension which is arranged to slide back and forth in the block to permit positioning of the undercutting blade which is fixed to the shaft of

the small motor unit.

To use the unit, the armature to be worked on is placed on the base, with its shaft set in a hole in a steel holder welded to the base. The commutator cutting assembly is adjusted vertically and horizontally to bring the undercutter blade in contact with the commutator, see photo at left.

Three-Section Card Speeds Motor Check

A 3-section perforated card, each section identically numbered, is used by the Electric Motor & Repair Service Company of Steelton, Pa., as a claim check and receipt, identification marker for the repaired unit, and a permanent file card to show what work was performed and when.

As indicated in the accompanying illustration, the right-hand section is detached and given to a customer at the time he leaves a motor for repair; the remaining two (still joined) sections then being secured to the motor, using the hole punched in the middle section for that purpose. When the repair work has been completed, the left-hand section (containing detailed information concerning the work performed, parts required, price and so on) is detached and filed as a permanent office record of the job, while the center section (still attached to the motor) remains as an identification medium when the customer returns to collect his prop-



Easy Bending of Rectangular Wire

An easy way to bend rectangular wire without breaking the insulation has been worked out in the shop of the Central Armature Works Inc., Washington, D. C.

As shown in the photo, the bending device is a small table-top assembly of a vise and some scrap parts. It consists of two discs, each 3 in. in diameter and 1 in. thick, mounted on a spindle through their centers and with a handle welded to the side of each disc. The vice is used to hold the spindle through the holes in the discs. The handles on the discs are made of flat steel stock, about 1 in. wider than the thickness of the discs. As a result, the bottom handle overlaps the top edge of the bottom disc and the top handle overlaps the bottom edge of the top disc.

In use the device acts like a plier. The wire to be bent is placed between the discs behind the spin-

NAME		Nº 4604.	J	O	CLAIM CHECK Nº 4604J
PHONE AMOUNT WORK AND	RECEIVED MATERIAL PHONE	PROMISED	OWNER		IT IS OUR CONSTANT ENDEAVOR TO PLEAS EVERY GUSTOMER, IF DUR BERVICE DO ROT BATHEFY YOU. TELL US SO FRANCE GIVE US A CHANCE TO MARE 4000. W VALUE YOUR PATRONAGE AND WISH IT HOLD IT, WE WILL NOT SE RESPONSIBL FOR LOSS OR DAMAGE TO CUSTOMER. PROPERT BY ANY MARKS SETONE OU
			Nº.	4604 J	ELECTRIC SERVICE & MACHINE CO INCORPORATED 740-70 N. PRONT ST. STEELTON P.



REQUIRE LESS THAN

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BY OTHER

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WITHOUT SACRIFICING AREA FOR NAMES

Modular design makes Couch registers available in many name capacities and height-to-width ratios at competitive prices. Flexible grouping of unique plugin name-tile units requires less than half the space used in other registers — without sacrifice to name area. Name tiles and long life lamps can be quickly changed by simply withdrawing the plug-in unit.



Couch's new modular staff in-and-out registers located at key points instantly indicate which staff members are in the hospital. Just a flip of a switch by a reporting member illuminates his name tile at all register locations, informing hospital personnel of his presence. When leaving the hospital, a switch operated at any register extinguishes his name tile at all registers. For hospitals with message centers, flashing name tiles (message indicators) may be incorporated.

To see how you can have a custom-built register system at standard system cost, write today for Bulletin H9.

Simplified Systems of Communication

S. H. COUCH COMPANY, INC., NORTH QUINCY 71, MASS.



dle (from where the user stands) and with a length of the wire on each side of the required bend arranged in front of each handle. The wire is quickly, neatly and safely bent by rotating the handles together (toward the user), until the required angle of bend is obtained.

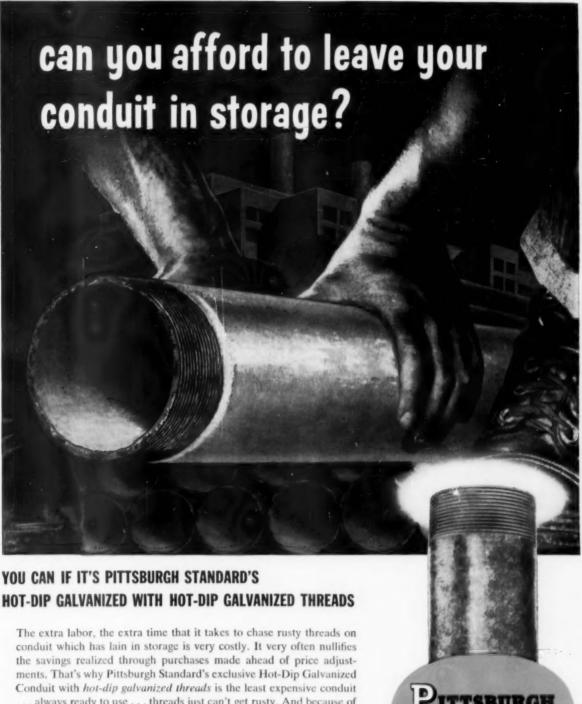
Double Decked Rack Provides Compact Storage

A relatively large assortment of slot wedges, dowells and sticks can be contained in minimum space by constructing a double-decked storage rack such as one built and used by the Electric Motor & Service Company of Steelton, Pa. As shown, the top tier of storage slots is positioned sufficiently above the lower tier to permit unobstructed vision of the bottom bins, while a plywood sheet tacked across the lips of the upper series of bins serves to confine the material being stored to the correct slot, prevent debris from falling in among the sticks and also to support any notices or drawings which the shop manager might wish to post in this location.

Dowells and sticks are fed into the series of bins from the bottom, as shown in the accompanying illustration, and they are removed in the identical, although reverse, manner. Lips at the bottom of each slot prevents the material stored from slipping out, while printed labels on the front of each slot accurately identify the material contained therein.



DOWELLS AND SLOT WEDGES are inserted and withdrawn from bottom of this two-tiered compact storage rack. Shop announcements and directions may be posted on plywood sheet spanning racks if so desired.



... always ready to use ... threads just can't get rusty. And because of the industry's most automatic conduit mills, this conduit with colorcoded thread protectors on ½ through 6 inch sizes is available at no extra cost! Get delivery and price information by calling or writing your nearest Pittsburgh Standard wholesaler or Pittsburgh Standard Conduit Co., 61 Bridge Street, Pittsburgh 23, Pa.

PLANTS AT MORRISVILLE & ETNA, PA.

RIGID STEEL CONDUIT . ELECTRICAL METALLIC TUBING . ELBOWS . COUPLINGS . FITTINGS

ELECTRICAL CONSTRUCTION AND MAINTENANCE . . . NOVEMBER, 1957

Data Sheet

Use Drills Suited to Work

Although twist drills can withstand much abuse, wear and breakage are reduced by using the right one for each job. The standard, 118-degree point angle is adequate for most work, but anyone can easily grind drills to match requirements of specific metals and plastics if he knows the fundamentals of a good cutting edge.

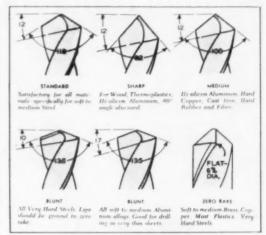
Variations in the point angle and lip clearance angle have different effects when working different materials. In general, blunt points are used on harder metals—where there is danger of tearing—and on very thin sheets. Sharper angles are more efficient when drilling plastics or soft metals. Specifications for various special purpose twist drills are shown in the accompanying drawing.

Grinding off the cutting edge of each lip gives a drill with zero rake. This makes the edge scrape rather than cut, and reduces the tendency of the drill to dig into brass and other soft metals and most plastics. Zero rake produces a stronger cutting edge for drilling hard steel.

Drills, like all cutting tools, require clearance behind cutting edges to permit chip removal. Variation in the clearance angle changes chip size and shape.

TWIST DRILL TERMS

CLEARANCE CONTING
ANGLE C



Lip clearance angle is ground by starting with cutting lips against the wheel and then dropping the other end through an arc equal to the lip clearance angle end as the drill is rotated through one sixth of a full turn. Easiest way to determine how much to lower the drill is to swing a new standard drill against the stationary wheel, noting how much movement is required to keep the ground surface in contact. This will indicate the arc required for a standard, 12-degree clearance angle.

The curved face of the web should be thinned after the point is ground.

There are also attachments for bench grinders that permit perfect mechanical grinding of drill points of any standard angle.

Most important factor in long drill life is proper drill press speed. Most well designed drill presses have a sufficient range of speeds for all but extremely specialized drilling. The above chart shows speeds recommended by Delta for metals of varying hardness.

14" High Speed 680, 1250, 2400, 4600, R.P.M. DRILL SPEEDS IN R.P.M.

14" Slow Speed 470, 780, 1300, 1950, R.P.M.

Diameter of Drill	Soft Metals 300 F.P.M.	Plastics and Hard Rubber 200 F.P.M.	Annealed Cast Iron 140 F.P.M.	Mild Steel 100 F.P.M.	Malleable Iron 90 F.P.M.	Iron 80 F.P.M.	Tool or Hard Steel 60 F.P.M.	Alloy Steel Cast Steel 40 F.P.M.
1/16 (No. 53 to 80)	18320	12217	8554	6111	5500	4889	3667	2445
3/32 (No. 42 to 52)	12212	8142	5702	4071	3666	3258	2442	1649
1 /8 (No. 31 to 41)	9160	6112	4278	3056	2750	2445	1833	1222
5 32 (No. 23 to 30)	7328	4888	3420	2444	2198	1954	1465	977
3 16 (No. 13 to 22)	6106	4075	2852	2037	1833	1630	1222	815
7 32 (No. 1 to 12)	5234	3490	2444	1745	1575	1396	1047	698
1 4 (A to E)	4575	3055	2139	1527	1375	1222	917	611
9/32 (G to K)	4071	2712	1900	1356	1222	1084	814	542
5/16 (L, M, N)	3660	2445	1711	1222	1100	978	733	489
1/32 (O to R)	3330	2220	1554	1110	1000	888	666	444
3 8 (S, T, U)	3050	2037	1426	1018	917	815	611	407
3 32 (V to Z)	2818	1878	1316	939	846	752	563	376
7/16	2614	1746	1222	873	786	698	524	349
5 32	2442	1628	1140	814	732	652	488	326
1/2	2287	1528	1070	764	688	611	458	306
9/16	2035	1357	950	678	611	543	407	271
5/8	1830	1222	856	611	550	489	367	244
1/16	1665	1110	777	555	500	444	333	222
3/4		1018	713	509	458	407	306	204

Figures are for High-Speed Drills. The speed of Carbon Drills should be reduced one half. Use drill speed nearest to figure given.

(Courtesy Delta Power Tool Div., Rockwell Mfg. Co.)

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FOR ECONOMICAL LOCAL SERVICE (132 BRANCHES)

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LOCAL STOCKS (13,584 IYEMS) OF

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Speed new power on old poles—cut costs with Anaconda Duralox Interlocked-armor Cable





METAL TAPE ARMOR AFFORDS
HIGH PROTECTION AGAINST
DAMAGE—NO CONDUIT NEEDED.

When a large Gulf Coast refinery needed additional power, the job was done *quickly* and *economically* because Duralox* could be strung on existing power-line poles—below the old lines. Neither new poles nor cross-arms were needed.

Installation time and costs are slashed with Duralox. Outdoors or in, it is readily trained around or over machinery, beams, piping and other obstructions in long, unbroken runs.

Duralox increases plant flexibility, affords easy maintenance and minimizes down time because it is generally accessible, easily relocated—100% salvageable,**Incr. U.S. POL. Off. 57 407 WE

NEW BULLETIN DM 5606 contains full information about Anaconda Duralox Cable. Write for your free copy today. Anaconda Wire & Cable Company, 25 Broadway, New York 4, New York.



Ask the Man from

ANACONDA

for DURALOX CABLE

EXISTING POLES are utilized at well-known refinery for additional power. Cable is Anaconda's 4/0 Awg Duralox Interlocked-armor Cable.

DURALOX CABLE is available in sizes No. 6 Awg to 750 Mcm-copper or aluminum conductors with rubber, plastic, or varnished-cloth insulation—up to 15kv. Underwriters' approved for 600 volts and 5000 volts, varnished-cloth insulation, galvanized steel armor!





Fifty foot of %" Scaltite has been installed on 400 Hayes Freight Line's truck-trailers. Here, Scaltite is being installed to taillight.

Freight line ends conduit failures on truck-trailers with Sealtite flexible, liquid-tight conduit

More than 50' of conduit are used on the average trucktrailer to protect wiring to marker lights, turn signals, etc. Original equipment is delivered with rigid conduit. But dirt and moisture kicked up from the road often corrode and knock out this conduit, or the swaying body cracks or breaks it.

Hayes Freight Line of Springfield, Ill., has solved this problem by replacing old conduit with flexible, liquid-tight Sealtite* on more than 400 trailers. After 3 years, not a single Sealtite installation has failed.

Outlasts unprotected metal . . . costs less to install! In steel mills, salt plants, refineries—on all types of equipment—engineers are calling for Sealtite in place of rigid conduit. It's easier, less costly to install (especially in cramped

Cutaway section of Type U.A. Sealtite shows tough polyvinyl jacket over flexible galvanized steel core. Copper conductor wound spirally inside conduit assures positive ground. spaces) and outlasts most metals in moist or corrosive atmospheres.

Where to get Seoltite—Electrical Wholesalers stock Types U.A. and E.F.† Sealtite in easy-to-handle coils. Standard color is black; also available in gray at no extra cost. Be certain you ask for and get the quality conduit marked "Sealtite." Buy it in long lengths and cut it on the job without waste. Special liquid-tight connectors by Appleton, Thomas & Betts, Gedney or Pyle-National are available. Free Booklet S-538 gives full information on Sealtite. Write: The American Brass Company, American Metal Hose Division, Waterbury 20, Conn. In Canada: Sealtite is approved by Canadian Standards Association, and sold by Anaconda American Brass Ltd., New Toronto, Ont.

*Trademark †Pat. Applied For 67180 Rev. WE



Insist on the conduit marked

flexible, liquid-tight conduit

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Alcoa and Wesco team up to offer a bonus for business that can't be beat! A dependable source for your aluminum Rigid Conduit and all your aluminum electrical requirements.

When you call Wesco, specify Alcoa. Alcoa offers a big bonus in experience. Years of research and engineering are built into every Alcoa product. This means big savings to you in long, trouble-free operation.

Remember Wesco the next time you need fast, economical service on Alcoa® Aluminum Conductors and Accessories and Alcoa Aluminum Rigid Conduit.



Always Use Alcoa Aluminum Accessories with Aluminum Conductors





Get Outstanding Performance with

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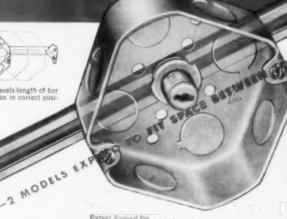
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XCLUSIVE FEATURES

- nevaled "nail" groups olim-
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- Safety-lock designed to hold arms together even of subjected to streets beyond U/L requirements!

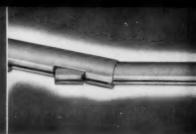


Patent Applied for



2-piece fixture stud travels length of bar hanger . . . tightens box in correct posi-tion for your job.





Also Manufacturers of:









Malleable Iron



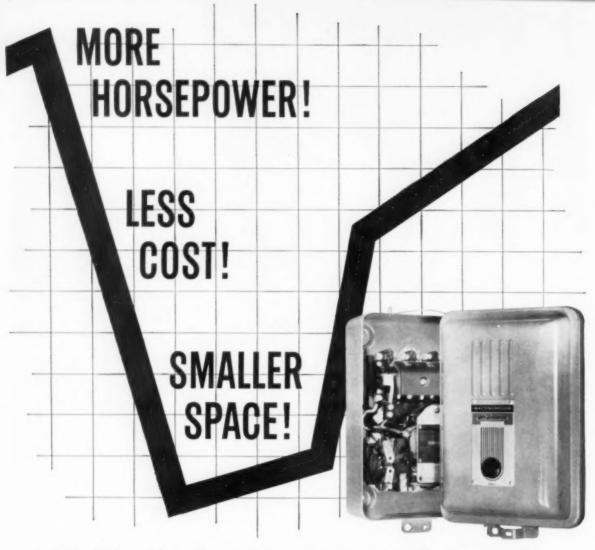
2 models fit space between joists or studding! All parts are tough, heavy gauge steel for maximum service. The simple 2-piece fixture stud gives you more wiring room. All components meet or exceed U/L requirements. No matter how you look at it, the cost and time saving features built into this new APPLETON Bar Hanger and Bar Set make them an outstanding buy ... Another example of APPLETON'S continuing program of market research to give you the finest and most efficient products in the electrical field.

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Here's real news for cost-conscious, space-conscious electrical planners.

Westinghouse Life-Linestarters® (sizes 0 and 1) have been uprated . . . giving you the advantages of more horsepower, less space, lower cost!

For example: if you've been controlling a 440-volt, 5-hp polyphase motor with a size 1 starter, you can get the identical control and protection with the smaller, less costly size 0 starter.

And speaking of performance...

Only Westinghouse starters have the De-ion® arc quencher, which greatly increases contact life by reducing burning and pitting.

Westinghouse starters utilize high-strength, non-carbonizing Rosite insulating parts for maximum safety and operating life,

Westinghouse starters have double-break, silver-to-silver contacts for longer life and greater dependability.

What's more, the entire starter line is designed to simplify installation and maintenance - featuring front-removable parts and straight-through wiring.

For the full story, contact your nearby Westinghouse sales office. Or write Westinghouse Electric Corporation, Standard Control Division, Beaver, Penna.

110			Volt		220 Volt				440-600 Volt				
		Ist 3		0 1		la 3			- 1	10		3ø	
SIZE	Old Rating	New Rating	Old Baling	New Rating	Old Rating	New Rating	Eld Eating	New Rating	(Hd Rating	Now Rating	Bld Baling	New Rating	
0	1	- 8	15/2	2	11/5	2	2	3	11/2	3	3	5	
1	1½	2	3	3	3	3	5	71/2	5	5	71/2	10	

Westinghouse uprated starters give you: More horsepower - in eight new starter ratings. Less cost and space - in applications where the rerated size 0 starter replaces the size I starter, and the size I replaces the size 2.

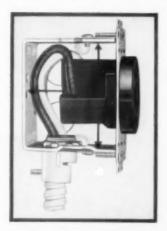
YOU CAN BE SURE ... IF IT'S Westinghouse







Easier to Wire ... Costs Less to Install



Listed by Underwriters' Laboratories, Inc.

Bryant's compact new No. 9306 50 ampere 250 volt heavy duty receptacle is designed for maximum wiring space (see cut) and minimum installation cost. Mounts flush in standard single gang box. Especially recommended for residential and commercial applications.

Plus These BRYANT Quality Features

Spring brass contacts provide greater electrical conductivity . . . Pressure type terminals recessed for safety. Easy to Wire . . . Accommodates No.6 wire. Rugged construction. Securely locked-in mounting plate . . . Wire strip gage . . . Illustrated with No. 9301 single gang plate. No. 9302 two-gang plate also available.

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THE BRYANT ELECTRIC COMPANY BOX D, BARNUM STATION, BRIDGEPORT 2, CONN.



99978

CALL WESCO FEE

There's a Safe and Dependable BUSS Fuse or FUSETRON Fuse to fit the needs of every user

If you want Plug Fuses . . .

Use BUSS Clear Window Plug Fuses

Their one-piece body and "safety" design guarantees protection.

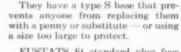
They are most convenient to use too, because real big windows and white backgrounds permits entire fuse strip to be seen. Even in poor light a blown BUSS fuse is easy to find.



If you want to make safe protection REMAIN SAFE as well as REDUCE blowing fuses . . . Use BUSS Fustats (have Type S base)



FUSTATS like Fusetron Fuses have a dual-element and therefore, stop needless blowing — and they do more.



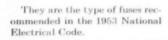


FUSTATS fit standard plug fuse holders by means of an inexpensive adapter that locks in place and needs never to be replaced.

If you want to reduce blowing of Plug Fuses . . .

Use FUSETRON dual-element Plug Fuses

FUSETRON Plug fuses protect like ordinary fuses against short-circuits and overloads but unlike ordinary fuses they won't blow on motor starting currents or other harmless overloads.





To protect motors and apparatus of voltages up to 125 against burnout . . .

Use 0 to 14 amperes BUSS Fustats



A FUSTAT of the proper size installed to handle only the motor current will reduce to a minimum the chance of a motor burnout from an excessive over-current. In like manner it will protect solenoids, coils and transformers against burnout.

FUSTATS have the same degree of Underwriters' approval for both motor-running and short-circuit protection as the most expensive devices

made. They give all the protection it is possible to obtain with any device on the market.

PROTECTION YET DEVISED!

A has been just one vital part — a thin narrow strip of tune metal. When the beat of a short-circuit is applied, the fuse link must melt and open the direction.

The high speed operation of the fuse reduces to a immunion the danger of short-circuit damage to wiring and equipment.

For other dependable protection over the years.

The fuse link is scaled in. Dust can't get at it Corresion or exidation can't increase its capacity or lengthen its blowing time.

There are no hinges, pivots or contacts to stick or not out of order.

Millians of fuses have been in operation 30 years more, because there has been no trouble on the

Play Safel Install BUSS Juses or



If you want fuses that — abolish all needless blows, stop overheating in panels and switches, protect motors against burnouts . . .

Use FUSETRON dual-element Fuses

With rare exceptions, ordinary fuses or circuit breakers do not protect except against short-circuit but FUSETRON fuses provide TEN POINT protection.



- 1. Protect against short-circuits.
- Protect against needless blows caused by harmless overloads.
- Protect against needless blows caused by excessive heating lesser resistance results in much cooler operation.
- Provide thermal protection for panels and switches against damage from heating due to poor contact.
- 5. Protect motors against burnout from overloading.
- Protect motors against burnout due to single phasing.
- Give DOUBLE burnout protection to large motors — without extra cost.
- Make protection of small motors simple and inexpensive.
- Protect against waste of space and money permit use of proper size switches and panels.
- Protect coils, transformers and solenoids against burnout.

FUSETRON duel-element FUSES save you time and money because they are made to PROTECT — not to blow.

If you want Non-Renewable Fuses . . . Use BUSS One-Time Fuses

They save you time and trouble because they get the same engineering care in manufacture as do all products carrying the BUSS Trademark.

Every BUSS One-Time fuse can be depended upon to operate as intended under all service conditions.



If you want Renewable Fuses . . . Use BUSS Super-Lag Renewable Fuses



The big advantage of these fuses over all other renewable fuses comes from the prevention of useless interruptions of service caused by needless blows.



The reason for this performance is found in the design of the fuse-case which assures good contact on the fuse link, even if the fuse is renewed by an inexperienced person—and by the time-lag built into the link that prevents the fuse from opening on motor starting currents or other harmless overloads.



If you want SAFE protection on loads above 600 and up to 5000 amps . . .

Use BUSS Hi-Cap Fuses

On voltages up to 600, high speed operation on heavy shorts limits current to safe values. This minimizes damage to equipment and cuts down dangerous stresses on transformers.



For Short-Circuit Protection or when fast opening is desired . . . Use BUSS Limitron Fuses

The extremely fast opening characteristics of these fuses prevent heavy short-circuit currents from building up under fault conditions.

For protection of TV, Radio, Instruments, Radar, Avionics and Electronic Equipment . . . Use BUSS and FUSETRON Small Dimension Fuses

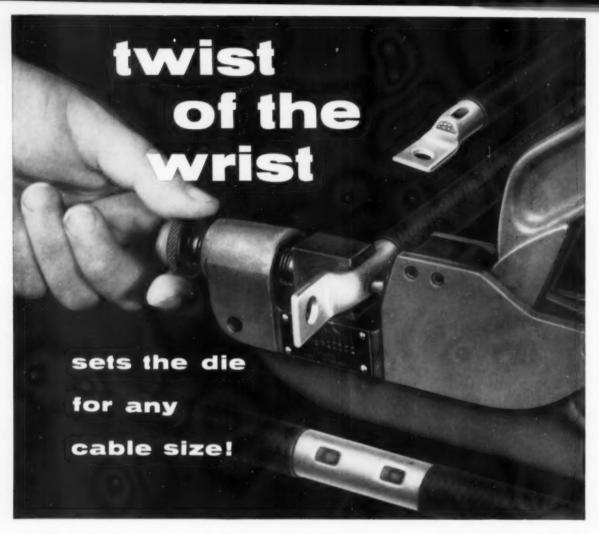


A complete line is available. Made in Dual-element (slow-blowing), Renewable and One-Time types in sizes from 1/500 ampere up.

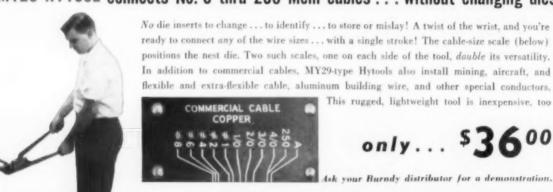
And there is a companion line of BUSS Fuse Clips, Fuse Blocks and Fuse Holders to take them.

When Fusetron frees do blow, there is no recall-bration as destand as content of the state of the fact of the case of the fact of the case of the fact of the case of the case

CALL WESCO STATE



MY29 HYTOOL connects No. 8 thru 250 Mcm cables . . . without changing dies!

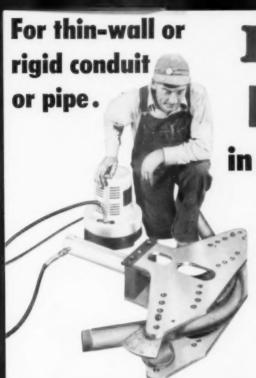


only ... \$3600

Ask your Burndy distributor for a demonstration.

Other Factories: New York, Calif., Toronto . Export: Philips Export Corp. Norwalk, Connect. . Toronto, Canada





BLACKHAWK PIPE BENDERS

in every size and price range!

You look ahead to amazing savings when you look over the world's most complete line of pipe benders . . . yours from Blackhawk. First choice with electricians everywhere! Exclusive advanced designs do the hard work for you . . . pay for themselves in 2 or 3 jobs! Be prepared to save up to 77% over cost of manufactured ells.

New super-portable featherweight aluminum models are easiest to set-up! Make bends in 3" pipe in just one bite! Turn out neater, more accurate jobs in half of the time required by ordinary benders.

Check this chart now. Then select the Blackhawk that is just right for you.

MODEL	PUMP	DIAMETERS					
5-30A	Hyd. hand pump	1, 1 1/4, 1 1/2, and 2" rigid conduit and pipe					
5-34	Hyd. hand pump	1 1/4, 1 1/2, 2" thin-wall conduit					
5-36	Hyd. hand pump	1 1/4, 1 1/2, 2, 21/2, 3, 31/2; 4" rigid conduit and pipe					
New 5-130 1-bite	Hyd. hand pump	1/2 - 2" rigid conduit and pipe					
New 5-132 1-bite	Electric-powered pump	1/3 - 2" rigid conduit and pipe					
New 5-137 1-bite	Hyd. hand pump	$1\%_0,1\%_0,2,2\%_0,3,3\%_0,4^{\prime\prime}$ rigid conduit and pipe					
New 5-138 1-bite	Hyd. hand pump	$1{}^{1}\!\!\!/_4,1{}^{1}\!\!\!/_2,2,2{}^{1}\!\!\!/_2,3''$ rigid conduit and pipe					
New 5-139 1-bite	Electric-powered pump	$1{}^{1}\!\!\!/_{\!4}$, $1{}^{1}\!\!\!/_{\!2}$, 2 , $2{}^{1}\!\!\!/_{\!2}$, $3''$ rigid conduit and pipe					
New S-140 1-bite	Electric-powered pump	$1\%_4,1\%_2,2,2\%_2,3,3\%_2,4^{\prime\prime}$ rigid conduit and pipe					

One bite does it! NEW Blackhawk aluminum benders slash costs 77%!



NEW S-130 FEATHERWEIGHT ALUMI. NUM BENDER for 1/2 to 2" pipe and rigid conduit—make full 90° bends in just one operation! Speeds making 180° bends, double offsets and compound bends. Cuts bending time in half! See for yourself! Try one on your next job.



NEW 5-140 FEATHERWEIGHT ALUMI-NUM BENDER for up to 4" pipe — Electric power operated. A cinch for one man to assemble and carry right to the job! Bends up to 2" rigid conduit in one lightning pass! Only 3 quick setups are needed for 3½ end 4" 90° pipe bends.



EXCLUSIVE "OPTIK-ANGLE"
GAUGE. A magical time and
work saver! Gauge is
mounted right on bending
shee to give exact degree
of bend during bending operation. Gone are guesswork, time-wasting measuring for determining correct
degree of bends!



ALUMINUM REMOVABLE
TOP PLATE "Lock-on" shoes
-no threading of shoes on
ram — simply place them
in position and insert lock
pim. Pipe is quickly positioned from about the removed
than "muscled" in from
side. Top-plate has snap
action, quick-lock both.

WHOPPING 77% SAVED ON BENDS! Dietz Electric Co., project fereman says, "Last job, we saved more than \$2,000 compared to manufactured ells. From now on, Blackhawk 5-139 is our production bender." Try Blackhawk . . the fastest bender on the market today.

BLACKHAWK bends prove BLACKHAWK'S best!



SEE YOUR DISTRIBUTOR ... TODAY!

. . . choose from his complete Blackhawk stock!





is your best cable protection

WATERPROOF, Bermico's water absorption factor is extremely low-its insulation factor extremely high—even under toughest conditions.

ACID RESISTANT. Resistant to soil acids and alkalies, Bermico Conduit is, itself, chemically inert.

SMOOTH INSIDE BORE, Quick and easy cable "pull throughs"-without danger of abrasions—when you're using Bermico inspected conduit!

UNIFORM. Four rigid factory inspections guarantee Bermico's uniformity of dimensions, specifications and quality.

NO SPLIT COUPLINGS. With Bermico's specially designed couplings, you end the expense - the loss of time required to replace broken couplings.

STRONG, Bermico Conduit is engineered to take the shocks and stresses of transport ... the heavy loads imposed during installation.

> TIGHT. All joints are precision milled for light, speedy installations.

EASILY HANDLED. So light in weight that one man can carry several 8-foot lengths at once-lay more per working hours.

Bends, Elbows, S-Bends and Curved Segments, plus a complete line of fittings: Adaptors, Plugs, Caps, Reducers, End Bells, Expansion Joints. Write for Bermico Conduit Catalog 12002.

Distributed by

Offices in principal cities

BERMICO FIBRE CONDUIT A Product of

BROWN AN COMPANY



Mills: Berlin, N. H.; Corvallis, Ore.

For competitive prices—Call WESCO—for Quality Electrical Supplies and Service



EVERYTHING ELECTRICAL.



Wherever motors must "do it the hard way," install Westinghouse

In powering flour-handling equipment in a typical modern bakery plant, the motor above illustrates better than a thousand words a big feature of Westinghouse power drives. This totally enclosed motor is good for years of dependable performance despite conditions that would choke an ordinary motor to death. Safe from explosion, too, if dust conditions become severe.

There are many other types of Westinghouse motors, for any kind of duty. Big point about all of them is their ability to "last forever" under severe conditions involving temperature, liquids, gas, dust or just plain hard work.

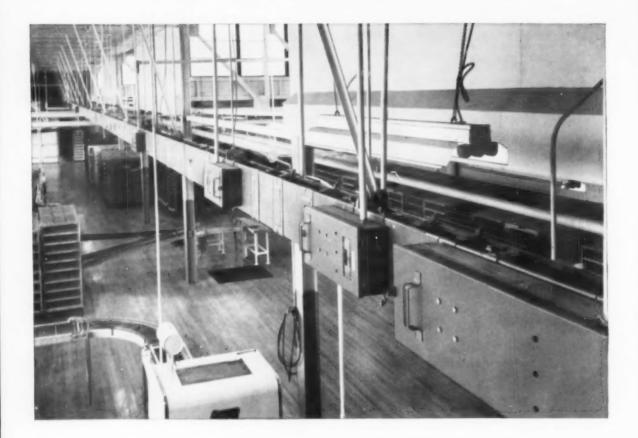
Write for motor data bulletin.

DP-5041-1

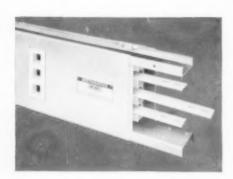
YOU CAN BE SURE ... IF IT'S Westinghouse



CALL WESCO SECTION



Safe and cool as an air duct, yet you "tap" its power wherever needed

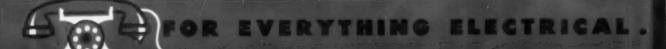


Westinghouse plug-in bus duct offers many advantages in light weight, case of handling, Available with copper or aluminum bus bars. This new bakery installation is a good example of the extra utility you get when Westinghouse plug-in bus duct is used. Lots of power is needed here . . . for mixers, conveyors and, most of all, the many baking ovens.

Wherever plant layout called for spotting a piece of equipment . . . there power was quickly tapped. Convenient plug-in units, with protective devices, attached easily to the duct. When changes are needed, plug-in units can be added without shutdown, yet with complete safety.

DP-5041-2

Westinghouse W



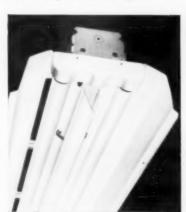
"Invisible" benefits help to make Westinghouse lighting pay for itself

There is more to good lighting than meets the eye.

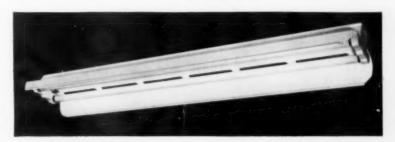
To the construction man, there's the question of fixtures that can be handled and installed without excessive damage. And the matter of installation as units or continuous troughs . . . ease of hanging.

Maintenance men want durability, ease of cleaning or replacing lighting elements . . . long life. Along with it all, of course, everyone wants the highest level of lighting for safety and fast production. Westinghouse fluorescent lighting has proved top-value on all counts in thousands of commercial, industrial and institutional jobs. Ask your Westinghouse distributor to show you the proof.

Shown at right and below, Westinghouse Type LPB and RLM fluorescent fixtures. Combining indirect and direct lighting, they provide highlevel, evenly distributed light.



At right, a good example of a simple and effective lighting installation with Westinghouse fluorescent fixtures.





Westinghouse panelboards save you many a (maintenance construction) "headache"

Whether your concern is installation of a distribution system or living with it forever after, you can prove that Westinghouse panelboards and switchboards can make life easier.

They are factory assembled, in units fitted to your specific needs. When they arrive on the job they do fit. The contractor is not left fussing and fuming to get the job done.

When they are in, that's that. Everything on the line, and those who handle it, are guarded by the types of protective devices best suited to the job in hand. They will last as long as the building in which they are installed, because that's the way Westinghouse engineers them.

YOU CAN BE SURE ... IF IT'S

Westinghouse



Buy everything electrical from your Westinghouse Distributor

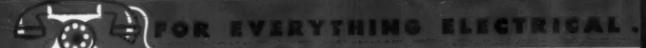


At left, a power distribution panel and a lighting panelboard, typical of Westinghouse easy-to-wire, simple-to-maintain equipment,

The Westinghouse Building-Type distribution switchboard below can be adapted to many combinations of power requirements, and expanded to any capacity with standardized units.

Ask for bulletins on Westinghouse panelboards or switchboards,



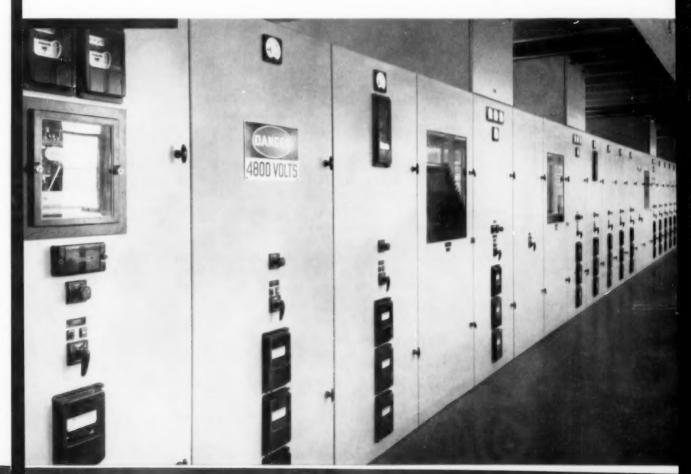


Contractors cut cost of electrical construction with Westinghouse Unitized Switchgear

For any size of distribution system, any power requirement, Westinghouse metal-clad switchgear assures the simplest installation, the most efficient operation. Unitized construction, factory wired and assembled, saves a great amount of time in the laying out and the installation of a heavy-duty system.

Full protection of all circuits is provided by built-in equipment; full safety for personnel by super-protective construction. Westinghouse Electric Corporation, Box 868, Pittsburgh 30, Pennsylvania.

Learn more about cost-saving Westinghouse switchgear from your Westinghouse distributor,



TALL WESCO



CRESCENT

ABC ARMORED CABLE, TYPE ACT

With Improved Features

EASIER • QUICKER • SAFER



★ PAPER TAPE which is tough, moisture-resistant yet easily removed, gives protection to the insulated conductors.

★ INSULATED BUSHING for protection against sharp ends of armor, furnished with each coil of cable.

BOND STRIP UNDER ARMOR is used in all sizes. A flattened aluminum bonding wire in contact with the under side of each convolution of the galvanized steel armor assures a permanent, low resistance through armor to ground.

★ PREFABRICATED BREAKING LINES. At intervals of every 1½ inches on CRESCENT ABC Armored Cable you will find a small cut mark. This cut mark shows the location of a prefabricated breaking line inside the armor.

Only a few short strokes of a hacksaw guided by the cut mark are required to cut through ONE outer ridge, and a bend by hand severs the armor. By actual test, this saves 30% of the time ordinarily required. A clean separation results, with no sharp edge. There is no chance of injury to insulation because only one OUTER ridge is cut.

The prefabricated breaking lines in the armor are so made that THERE IS NO REDUCTION of tensile strength, bending qualities, crushing resistance or electrical conductivity. This armor construction meets all requirements of Underwriters' Laboratories.



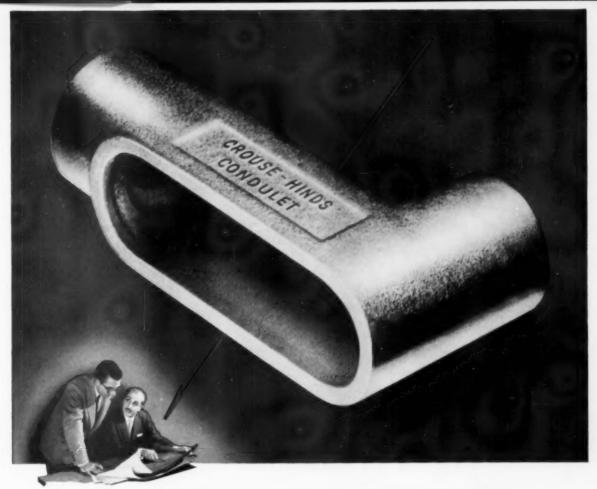
CRESCENT WIRE & CABLE



CRESCENT INSULATED WIRE & CABLE CO.

Trenton, New Jersey





Now, more than ever, engineers specify: "CONDULETS ... or approved equal"

After 51 years of use in every conceivable application, Condulets remain the standard of quality for rigid conduit fittings.

It's not hard to see why. Pick up any Obround Condulet, for example, and note such features as these:

TAPER TAPPING: Condulet threads are taper tapped to match tapered conduit threading . . . giving you a rigid joint that will not loosen ... insuring permanent ground continuity!

INTEGRAL BUSHING: A smooth, rounded, burr-less surface that protects wire in-

WEDGE NUT COVER FASTENER: This exclusive Crouse-Hinds feature is part of the cover itself. Screws can't fall out. No screw holes to locate. No protruding screw hole ears to damage cable.

LONGER HUBS: Conduit can be tightened completely without bottoming on integral bushing. And there's generous surface space for good wrench hold.

MATERIAL: Feraloy, a special alloy that is strong and tough, resists corrosion . . . gives sharp, full threads.

FINISH: A triple-layer treatment that exceeds Federal and U.L. specs for longer-lasting protection.

Where else can you find all (or even most) of these features? You can find them all in each of the 45 types of Obround Condulets . . . sizes ½" to 6".

There is a type for every need, including a wide selection of interchangeable covers and wiring devices. Just call your Crouse-Hinds distributor and ask for "Condulets!"

*CONDULET is a coined word registered in the U.S. Patent Office. It designates a product made only by the Crouse-Hinds Company.

you get EXTRA PROTECTION

plus Extra Economy with



Economy Fuses give you Extra Protection with such built-in superiorities as

Specially Developed Metal Alloys

These alloys, because they are developed to meet specific requirements, assure "quick as a wink" action when the danger point is reached. Yet they also assure extra protection against needless fuse blows due to sudden power surges or current fluctuations.

In addition to this extra protection, Economy brings you the extra advantage of a

Complete Line of Fuses

Nearly 400 types, sizes and capacities enable you to select exactly the right fuses, specially engineered to best meet your requirements.

Extra Protection plus Complete Line Selection add up to extra economies such as:

- · Reduced fuse replacement costs
- · Fewer repairs
- · Longer life for electrical equipment
- Reduction of work stoppages due to fuse blows

NEARLY 400 TYPES, SIZES AND CAPACITIES

DELAY® RENEWABLE CARTRIDGE FUSES Knife blade or ferrule types, sizes from 2" to 135"; to 600 amps, 250 voits and 600 voits.

ECONOMY RENEWABLE PLUG FUSES Available in standard and sub-standard sizes; from 10 to 30

ECONOMY FUSTATS Resist tempering and over-fus-ing. Available from 1 to 30 amps.

ECONOMY FUSE PULLERS Treated and sealed to minimum monsture absorption. Withstar breakdown text of 35,000 voi

ECONOMY CLIP-TITE.
Positive protection insures tight electrical contacts of fuse clips. Prevents heating of contacts.

Economy Trade Name fuses carry full Underwriters' Laboratories approval and listing.

SEND TODAY for your FREE Economy Fuse Folder No. 3. This handy size folder lists the nearly 400 sizes, types and capacities of fuses available.

PURPOSE

ECONOMY FUSE & MFG. CO., 2717 Greenview Ave., Chicago 14, III.

Efficiency

CABLE STRAIN CLAMP

Capable of withstanding a direct pull of over 12,500 lbs. before slipping, this clamp can be furnished either with eye or clevis. Three clamp sizes accommodate all cable sizes from 1/0 to 1,500,000 c.m. Constructed of malicable iron, this clamp has a high ridge across the center of the cable channel and a U-bolt at each end.



NON-ADJUSTABLE INSULATOR SUPPORT

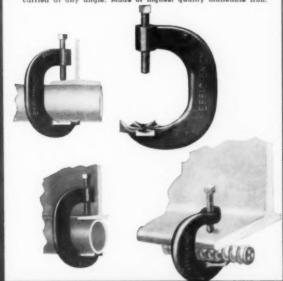






CONDUIT HANGERS

Correctly designed for carrying armored cable or $\frac{1}{2}$ " to $2\frac{1}{2}$ " pipe along open steel construction. Radiating ridges and the five point gripping surface keeps the pipe suspended dead center, with the set screw above permitting the cable or pipe to be carried at any angle. Made of highest quality malleable iron.



SUSPENSION DEVICES

ARE TIME AND COST SAVERS

By eliminating the need for punching, drilling or burning through beams in order to hang electrical mountings... Efficiency Suspension Devices can save you time and expense on practically every construction job.

BUSHING MESSENGER SUPPORT

This support is designed to suspend wire or cable from messengers where beam mounting is not possible. This support is a combination of our Type G Bushing Support with strip steel messenger attachment. Furnished complete with malleable from support, steel messenger attachment and all bolts, as illustrated.



BUSHING SUPPORTS







TYPE VA

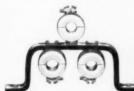
Designed to eliminate the drilling of holes for mounting, these supports are adjustable to any angle. Made of malleable from with highest quality split porcelain, they are furnished for AC-DC service to handle 5/16" to 23% cable. Type G is clamp-mounted, while Type VB and VG bolt mounted through its circular base.

BUSHING RACKS AND SUPPORTS





Available in 2, 3, 4, 5 and 6 bushing racks for AC or DC service. Only a single bolt is required to support the bushing and clamp the support to the rack. For 5/18" to 23%" wire sizes.



NESTED BUSHING RACKS AND SUPPORTS

Simply and compactly designed to carry conductors equidistant from center to center. Each bushing is a separate unit, allowing independent installation of each cable line. Available in 2, 3, 4, 5 and 6 bushing racks.

EFFICIENCY ELECTRIC AND MANUFACTURING COMPANY

Write for Catalog East Palestine, Ohio

WESCO

Here's **ZONALARM** in a shopping center

Contractors are finding many business opportunities with ZONALARM. It's

the only complete low-cost fire alarm system! Zonalarm sells to farms and larger homes, warehouses and smaller factories, motels, offices, retail stores. For example, here's how Zonalarm was installed at modern, much-publicized Mid-Island Shopping Center, Long Island.

ZONALARM at Bond's. At top you see U.L.-Listed "heat-guard" thermostatic unit, watching over work room. Each fire-prone area, such as shipping, stock rooms, boiler room, is naturally made a separate fire-warning zone.











ZONALARM at J. J. Newberry. "Heat-guard" on ceiling above escalator is teamed in parallel with others to make one *zone* from entire sales floor.

Zonalarm power unit is mounted high on wall of manager's office at J. J. Newberry store in Mid-Island Shopping Center. In this unit, batteries and automatic relay insure complete operation even though power fails. Below power unit, by executive's elbow, is Zonalarm main indicator panel. "Heatguard," set off anywhere in store, rings bell and lights panel indicating location of fire. Manager can conveniently test every circuit and the battery operation, using controls on this main indicator panel.

ZONALARM at S. S. Kresge. Zonalarm can also sound warnings in areas from control panel. S. S. Kresge installation at Mid-Island shows typical use of Zonalarm extension bell (upper left) outside building. Auxiliary uses, like burglar alarm or exhaust-fan cut-off, also help contractors sell Zonalarm.

ZONALARM is easy to sell because it is complete, proven, low in cost, highly flexible to meet varied needs. Zonalarm is easy to install, too—because of its simplicity and quality components which eliminate maintenance and costly call backs. Write: Dept. EC-11, Edwards Company, Inc., Norwalk, Connecticut. (In Canada: Edwards of Canada, Ltd., Owen Sound, Ontario).

Specialists in Signaling Since 1872

Why it pays to specify Westinghouse **IGNITRON TUBES,** the "industry standard"



Westinghouse invented and produced the first Ignitron tube. Since then, constant improvements have maintained Westinghouse leadership in the Ignitron field—improvements that are today's accepted industry standards:

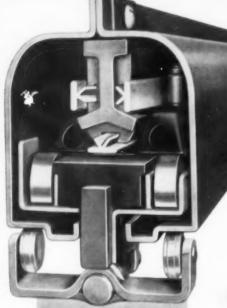
- Kovar seals to permit use of steel envelopes.
- Improved Ignitors to insure accurate ignition.
- Thermostatic control for overload protection and water savings.
- Stainless steel envelopes for corrosion-free long life.
- Inner cylinder in direct contact with cooling water.

The wide acceptance of Westinghouse Ignitron Tubes by the welding industry is proof of their superior quality and performance. It will pay you to use Westinghouse Ignitrons in both new and existing welding equipment. For your convenience they are readily available through Westinghouse Distributors everywhere.

Westinghouse

Electronic Tube Division - Elmira, N. Y.

CALL WESCO STATE



SAFE RUGGED DEPENDABLE ECONOMICAL

moving power systems

go where the "loads" go!

A FEEDRAIL "moving power system" lets you deliver power where you want . . . when you want it. Designed to go where the loads go, FEEDRAIL feeds power through smooth-riding, engineered trolleys to provide outlets anywhere along the line.

Since 1935, FEEDRAIL has proved the safest, most dependable way to distribute power to mobile equipment. Basic designs remain unchanged because no other systems offer comparable safety and dependability. And here's why:

- 1. Steel enclosed design eliminates accidents -
- Unfailing reliability prevents costly service interruptions due to wiring failure —
- Heavy-duty construction withstands hard usage, keeps maintenance costs down.

INSTALLATION NO PROBLEM: Track sections are prefabricated of heavy guage steel in practical lengths. Precisely constructed for fast installation, FEEDRAIL offers no problems—even where curves are involved. And FEEDRAIL can be readily extended, modified or relocated.

INFORMATION FOR YOU: Your local Wesco representative can show you how easily the right FEEDRAIL system can be installed in your plant. See him for details or write Feedrail – Dept. C11.

FEEDRAIL "100"—For cranes and hoists, portable tools, production and test lines, machine tools, airport hanger doors. Continuous current rating — 100 amperes. Send for Bulletin No. 50.



FEEDRAIL "80" - For light hoists, cranes, small portable tools, lighting, business machines, cutting and sewing equipment. Continuous rating - 60 amperes. Send for Builetin No. 45.



FEEDRAIL "HEAVY DUTY" For heavy duty crores and hoists, large machine tools, conveyor assembly lines. Centinuous current ratings – 225, 375 and 500 amperes. Send for Bulletin No. 35.

Never Becomes Obsolete

FEEDRAIL CORPORATION

Subsidiary of Russell & Stoll Company, Inc.

125 BARCLAY STREET . NEW YORK 7, N. Y.

ELECTRIC FEEDRAIL

SPECIALLY QUALIFIED REPRESENTATIVES IN PRINCIPAL CITIES



GENERAL CABLE



the largest independent manufacturer of electrical

WIRES and CABLES



QUALITY PRODUCTS to cover every wire and cable requirement.

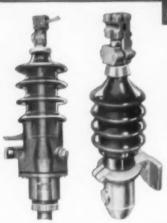
- BARE AND WEATHERPROOF
- BUILDING WIRES AND CABLES
 Rubber and Thermoplastic
- SERVICE CABLES

- POWER AND CONTROL CABLES
 - Rubber and Thermoplastic Asbestos Varnished Cambric
- SAFETY MINERAL INSULATED WIRING SYSTEMS

for quality and service... specify GENERAL CABLE

GENERAL CABLE CORPORATION, 420 Lexington Avenue, New York 17, N.Y.

CALL WESCO SET









A TYPE AND SIZE OF PROVED DESIGN FOR EVERY HIGH VOLTAGE CABLE.

Sodertite, Capnut, Disconnecting-Solder, Clamp or Press style connectors for copper conductors, Press style for ALUMINUM conductors—Wiping sleeve or stuffing box cable entrance seals—Conduit and armor fittings—The G&W line of potheads is complete.

Send for series "A" bulletins



Send for series "B" bulletin.

FUSE CUTOUTS







For fusing or load break switching of primary circuits in subway, vault or overhead installations. All steel, explosion proof enclosure, hermetically sealed, oil filled, protects men and equipment by safely withstanding high pressures of fuse clearing heavy short circuits.

Send for series "C" bulletin.

SWITCHES LOAD BREAK









PROVIDE CABLE SYSTEM FLEXIBILITY

Reduce overtime work on system maintenance. Sectionalize your distribution system with Type "RA" load break oil switches. Isolate cable faults and restore service by switching loop or duplicate feeders - manually or automatically.

Send for series "D" bulletins.

SPLICING



SAVE TIME AND MONEY

- Each item supplied in the correct quantity for a properly designed joint.
- Time and expense of securing various items from different sources are saved.
- · Accumulation of dead stock is avoided. No waste.
- All materials are kept clean and ready for use.
- Each Splicing Kit is labeled for easy identification.
- · Cable splicing costs can be determined accurately. Send for series " J" bulletins.

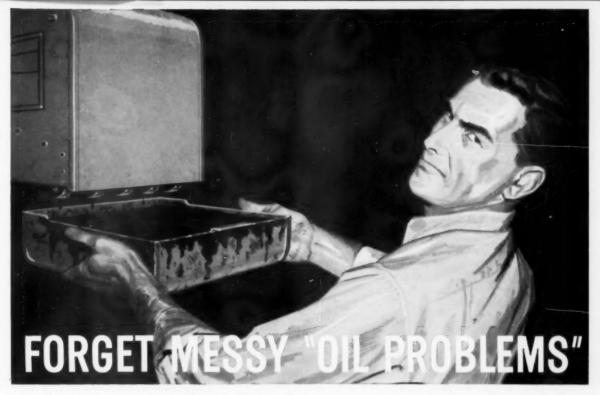
Complete catalog including separate bulletins on various cable devices will be sent on request



SPECIALTY 3500 W. 127th Street, BLUE ISLAND, ILL.



EVERYTHING ELECTRICAL



New Westinghouse "JF" Autostarter

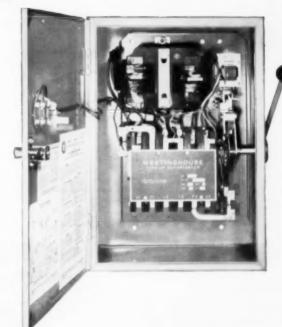
offers air break contacts

in all ratings

Gone forever are the costly "oil problems" of oil level checks, spilling, oil changes, and hazards from contamination. With air break contacts in all ratings, the new Westinghouse "JF" manual autostarter is the simplest to maintain and most versatile unit on the market.

Tests prove that air break arc interruption provides substantially longer contact life. The Westinghouse "JF" autostarters contain premium quality silver alloy contact surfaces, and in addition, De-ion® arc quenching chambers, which insure long trouble-free service.

POWER-UP with Westinghouse Controls — For all the facts on this new manual autostarter, call your Westinghouse sales engineer or distributor. Or, write Westinghouse Electric Corporation, P.O. Box 868, 3 Gateway Center, Pittsburgh 30, Pennsylvania. J-22056



YOU CAN BE SURE ... IF IT'S Westinghouse



CALL WESCO FEE





IDEAL WIRING TOOLS..

a good way to cut costs thru faster better work by the Man-on-the Job!

Ideal Wiring Tools help your men do a better job faster. Contractors and electricians coast to coast consider Ideal tools "standard" equipment for ease of use and efficiency on the job.

Get exactly the tools you need-when you need them. It's fast and economical, just specify Ideal—one dependable source for everything in electricians tools. Shown here are just a few items from the complete Ideal line.



VOLTAGE TESTER

"Easy Tester" 2-ways safe

This is a voltage tester that protects you two ways! It has both a neon test lamp and a calibrated solenoid indicator ... each independent of the other. No chance of failure to detect voltage. Handy center mount for the prod keeps the indicator always in the line of vision. Case is of double strength seamless plastic, with no external metal. Molded prod handles have "No-Slip" safety rings, are mounted on 30" leads. Prods when not in use are completely shielded in case. Tests 110 to 550 volts AC-110 to 600 volts DC.



(IDEAL

FISH TAPE REEL and PULLER

The big grip that takes most of the work out of fishing. Actually lets you do the job in 50% of the time as compared to hand fishing . . . like an extra arm or bigger muscles. And they may save your life-because the tape is always in reel or conduit. It can't ever spring loose into "hot" wires or moving machinery. Also, no cuts, skinned fingers or lost time! 50 to 200-foot lengths - all tapes of finest oil tempered flat spring steel



Low Cost WIRE STRIPPER

Strips wires from 10-18 ga. cleanly, quickly, and easily. Also used for cutting and "looping" wires. A handy addition to every electrician's tool kit. Sturdy, compact-constructed of hardened steel for rugged duty and long service life. Contoured plastic grips for easy handling and safety. Overall size 6". Flat design for easy tool kit and pocket fit.



(IDEAL) FISH TAPE WINDER

"Fishing" made easy Just roll it around our IDEAL Fish Tape Reel. Spreads the Reel housing, so that Tape reels in or out much more easily.

Just rotate the handle, Double rollers hold the Winder in place. Three sizes fit all IDEAL Reels.



(IDEAL) "E-Z" STRIPPER

6 models including *UF cable stripper

Used more, liked more and sold more than any stripper we know of. Rugged, all-steel and as easy to use as pliers. They are so designed that they can't damage wire or crush stranded wire ends, because of their automatic lock. Replaceable blades are of hardened steel. Six models handle all wire gauges from No. 8 to No. 26, also 300 ohm TV down lead and most non-metallic sheathed cable. The stripper for heavy-duty work.

*"E-Z" UF cable stripper strips the outer sheath and web, then the inner conductors (2 or 3 wire, 12 or 14 ga.) from non-metallic sheathed cable—without cutting, nicking, or other damage to wire ends.



IDEAL WIRE LUBE

Less Work, Strain, and Danger of Insulation Breaks!

IDEAL Wire-Lube actually lubricates wires and cables just like the oil you use in your car to lubricate bearings. It lets you slide wires into or out of conduit easier, dries to a fine powder, is as gentle on your hands as a fine soap. It is non-combutible appropriate for the your names as a line study. It is non-combustible, non-corrosive. For use on rubber, lead or plastic covered wire or cable. Available in 1 quart cans to 5-gal, pails.



COMBINATION FUSE PULLER AND TEST-LITE



new tool for maximum safety in pulling cartridge-type fuses and in checking electrical connections. Sure-grip dielectric plastic handles make fuse pulling faster, Positive testing is assured by built-in resignation. rosalive testing is assured by built-in resigners which limit current flow through the tester. Test capacity from 100V. to 600V, AC or DC. Designed for use on fuses up to 100 amp., 250 volts and 60 amps., 600

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Building Wire that offers you big money savings in materials cost . . . and KW improvements that make it as easy to work with as copper!



Portable Cord that gives you three times longer life than the average molded cords of other makes. It's proved by 12,000 tests over 3 years!



Control Cable backed by 67 years of experience in electrical wire and cable manufacturing. That means dependable security for public safety!

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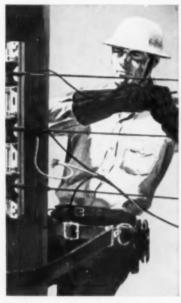
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CABLE TRIPLEX CABLE

SERVICE ENTRANCE



Power Cable that eliminated 26 competitive cables in from zero to 2,509 hours of a High Ozone Attack test . . . then went on to 6,000 hours!



Triplex-combining three wires in one compact assembly-makes possible neater services, fewer attachments, easier installations-for big savings!



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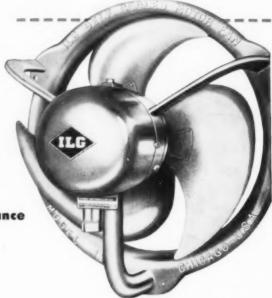
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Efficient operation calls for efficient ventilation... ILG ventilation! Equipped with self-cooled motors, Ilg Propeller Fans assure you longer, trouble-free, dependable performance. Rated and certified under standard testing codes, you can count on Ilg Fans to move more air. Dynamically balanced fan wheel, direct-connected to motor, assures smooth, quiet, free-running operation. And Ilg's famous "one-name-plate" guarantee covers both fan and Ilg-built motor as a unit.

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TYPE "0" —powerful, quiet, efficient . . . plus long life, minimum maintenance. Self-cooled motor. 6" to 48" diameter wheels.

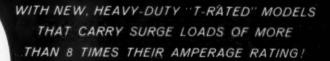


TYPE "I"—has TYPE "Q" wheel and ball bearing, explosionproof motor. Non-ferrous frame, 16 capacities.



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Now Intermatic "T-Rated" switches give extra operating capacity, for greater dependability—at unusual low cost.

- New Alloy-T contacts are remarkably immune to pitting, arcing and sticking.
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Easy to see, easy to set dials—simple installation — and trouble-free performance save time and money for both you and your customers. A complete line of 63 job engineered models and optional raintight, flush mount, or 2 in 1 cases take care of any industrial, commercial or residential job:



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Tailored for every industrial job-right here...

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No. 2251. TWO-CELL AUTOMATIC SPOTLIGHT Chrome finish with black decoration. No. 1 seller.



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No. 1251A - Rugged insulated case (ethyl cellulose) will not shatter, crack or dent. Withstands deterioration from water, oils, greases, gasoline, alcohols and acids. Unbreakable safety-glow lens-guard. Also available in three-cell size . . . No. 1351A.

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Gives ideal balance of long shelf-life and service-life for all applications, except extreme heavy-duty uses where "Eveready" No. 1050 is recommended.



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"EVEREADY" No. D-99 **HEAVY-DUTY** FLASHLIGHT BATTERY

New inside-out design for plus power, longer life, dependability for day-in, day-out heavy duty use.



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Specially designed for general ignition, telephone, portable instruments, electronic equipment, etc.

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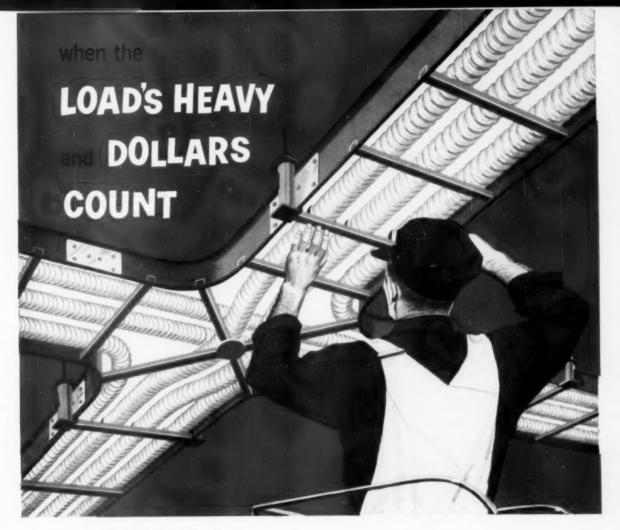
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National Electric Nepco-Lok, Interlocked Armored Power Cable, can provide you with the answer to lowcost, heavy-duty industrial wiring.

The outstanding flexibility of Nepco-Lok cuts installation costs because it's speedily installed around corners or projections indoors or out. In addition it is often possible to economically relocate Nepco-Lok to meet the power needs of expanding production facilities and thereby reduce the cost of future plant modernization.

Nepco-Lok is available in 600 volt and 5,000 volt constructions with three and four conductor assemblies and also in multi-conductor control cables. National Electric Nepco-Lok offers industrial heavy-duty capacity at low cost plus the added insurance against production stoppage offered by a system of individually protected cables.



Whether you're working on the modernization of old facilities or new plant construction, you'll find it profitable to get the details on National Electric Nepco-Lok Interlocked Armored Cable.

Call your National Electric representative or write National Electric Products Corporation, 2 Gateway Center, Pittsburgh 22, Pa.



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2 Plants • 12 Warehouses • 41 Sales Offices

NE SPECIAL CABLES WILL MEET YOUR REQUIREMENTS FOR POWER, CONTROL AND ELECTRICAL EQUIPMENT

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BE MODERN,

stop "knife throwing"
buy Westinghouse

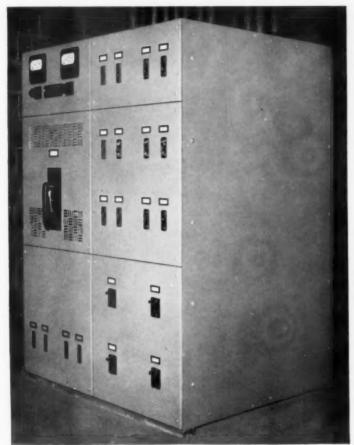


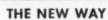
the new way to insure the most convenient, most flexible and safest centralized control of circuit distribution is with Westinghouse switchboards. Factory wired and assembled to your specifications, a building-type distribution switchboard like the one at right is a cinch for the contractor to install and a pleasure to operate and maintain.

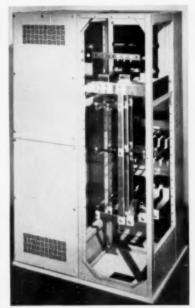
the old way was a "knife-throwing" act in which electrical men worked with open-blade switches and a Chinese puzzle of wires, cables and fuse blocks.

The illusion that clinging to the old systems is economy just because "there's a lot of good years in it yet" is quickly dispelled when you examine the facts. Let a Westinghouse engineer show you what it means to reduce power losses, cut accident and insurance rates, save space and manhours with modern distribution equipment.





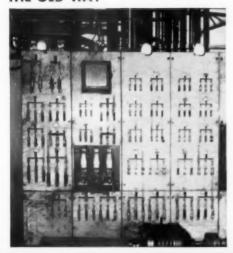




Cross section of switchboard cell showing sectionalized construction, bus bars and supports, convenient access.

At left, a Westinghouse building-type distribution switchboard. Totally enclosed construction, dead front, safe and simple. Protective devices built in.

THE OLD WAY



current literature tells the story of Westinghouse switchboards and how to plan distribution the new way. There are bulletins on panelboard selection, too. Write for your choice today. Westinghouse Electric Corporation, Box 868, Pittsburgh 30, Pa.

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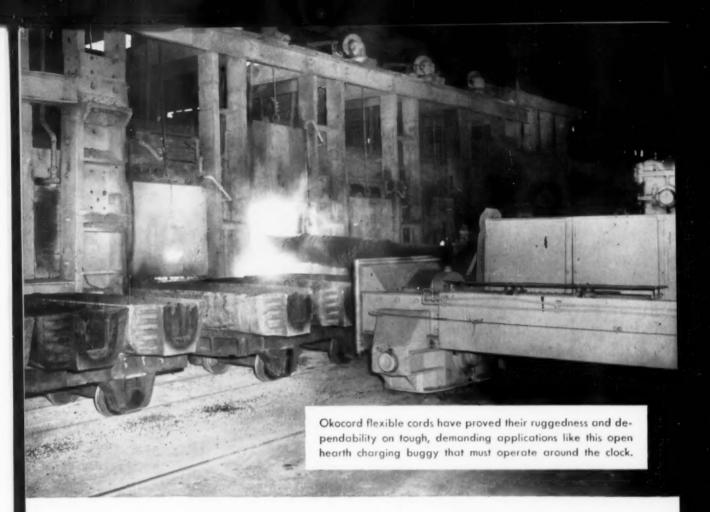
OLIVER ELECTRICAL MANUFACTURING CO.

Battle Creek, Mich. - Pittsburgh, Pa.





FOR EVERYTHING ELECTRICAL.



Heat and abuse . . . no problem for Okocord* portable cables

The charging machine above is controlled by Okocord flexible cables. They have to withstand constant heat and abrasion. And they're wound and unwound about a small reel every time the charging arm enters the furnace-literally hundreds of times every day.

Okocords are used for tough applications like this because they've been proved in service in steel mills . . . and in every other kind of plant. The rugged Okoprene sheath has superior flame resistance . . . plus the tire-tread toughness and extra flexibility that come from being cured in a continuous metal mold. The Okocord conductors have maximum flexibility because they are made of fine copper wires twisted together with a short lay.

Add to this Okocord's carefully-selected, tough, heat-resisting insulation and Okonite's reputation for superior engineering and manufacture . . . and you'll see why you should specify Okocord for every tough portable cord and cable application. Get complete details from your Okonite salesman or write for Bulletin EC-451 The Okonite Company, Passaic, N. J.



*This product formerly carried the trade name Hazacord



where there's electrical power . . . there's OKONITE CABLE

WESCO



AB-I's prevent single phasing?

SURE! No more motor burnouts or other equipment damage caused by fusible protective devices opening only one phase in a polyphase circuit. With a Westinghouse AB-I circuit breaker, all lines are opened every time on circuit faults. A common trip bar breaks all contacts simultaneously. If you are going to provide protection for equipment, it makes sense to provide complete protection. Circuit breakers not only prevent "single phasing", but they are sealed at the factory so that unauthorized personnel can't enter and "bridge" circuits. Then, too, you know that Westinghouse circuit breakers will operate properly because every one is completely tested at the factory.

Too expensive? NO! In many cases, Westinghouse AB-I circuit breakers actually cost less than safety switches.

Get the complete story from your Westinghouse distributor. Ask him for Descriptive Bulletin 30-250 or write: Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pa.

J-30268







the O.Z. SHURELUG

has more of the features

// you want...



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The O. Z. ShureLug is the newest addition to the complete O. Z. line of electrical fittings; more proof of O. Z.'s policy to make available dependable products at realistic prices.



The new O. Z. ShureLug is available for a wide range of sizes, including "in between" sizes usually found only in more expensive makes. This means that whether the job calls for #14 sol. or 1000 MCM cable, there will be an O. Z. ShureLug that will meet your needs more closely, more exactly, for a more secure, more dependable connection.



Here's variety too!: O. Z.

ShureLug is available in single barrel, double barrel, and triple barrel models...
with socket heads or hex heads in single hole, and four hole styles, depending upon sizes selected. Here again, premium selection at practical prices!



O. Z. ShureLugs are priced no higher thin other compelitive brands, but you get so other compelitive brands, but you get so much more! Because O. Z. ShureLug is much more sizes, more models, you buy made in more sizes, more models, you buy noty the capacity you actually need only the capacity that you'll actually use. Only the capacity that you'll actually use. Why spend more for over-sized lugs when why spend more for over-sized lugs when O. Z. has the size you want, the model you need, at the low economical prices you want to pay?



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"GUIDE-LINE" extends full length of tubing. By properly aligning with calibrations on Republic bender, bends are kept in the correct plane, thus avoiding costly "wows". Both "Inch-Marked" and "Guide-Lined" features come in ½", ¾", 1" and 1¼" sizes.



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World's Widest Range of Standard Steels



EXCLUSIVE "INSIDE-KNURLING" reduces friction, thanks to inside ball-bearing surface-makes wire pulling as much as 30% easier. ELECTRUNITE E.M.T. is made to Underwriters' Laboratories Standards—is approved by the National Electrical Code for concealed, open and concrete construction—meets A.S.A. Specification C80.3 and Federal Specification WW-T-806.

UNIFORM DUCTILITY in every foot of Republic ELECTRUNITE E.M.T. assures smooth, accurate bends every time-with no costly kinks. Welded by the famous Electrunite Process, this quality conduit is 100% Republic-from ore to finished product. And rigid manufacturing-controls assure complete uniformity.



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CALL WESCO





Do you worry about the cost of wiring that new power distribution system

ON A SUNDAY AFTERNOON?

Sure, new power systems cost plenty — and it takes close figuring to get maximum results at reasonable prices. But you don't have to worry about getting dependable wiring at the right price — an armored cable and rack system using Rockbestos A.V.C.° Interlocked Armored Cable is your best solution. Here's why:

- Rockbestos A.V.C. Interlocked Armored Cable gives more current capacity than cable in conduit or other armored cable.
- Rockbestos A.V.C. Interlocked Armored Cable eliminates the need for costly conduits or ducts — it's easily installed on racks or hangers.
- Less layout time less installation time mean important dollar savings.
- It permits planning for future installations — again at minimum cost.

Get full details on dollar saving Rockbestos A.V.C. Interlocked Armored Cable — write now for complete specification and application data.

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NEW HAVEN 4,

NEW YORK, CLEVELAND, CHICAGO, PITTSBURGH, LOS ANGELES, DETROIT, ST. LOUIS, ATLANTA, DALLAS, OAKLAND, SEATTLE

*A.V.C. Asbestos, varnished cambric insulated. Single conductors are standard N.E.C. Type AVA power

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Shortproof industrial flashlight The Ray-O-Vac line of heavy-duty industrial flashlights and batteries has been specifically designed to meet the most rugged demands of modern industry. Always look to Ray-O-Vac to meet the needs for portable light.

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Division Offices: 212 East Washington Ave., Madison 10, Wisconsin. 1388 Madison Avenue, Memphis 4, Tennessee. 461 Market Street, San Francisco 5, California. 1775 Broadway, New York 19, New York. Ray-O-Vac Canada, Ltd., Winnipeg.

N237 Continuity Tester. Combination floshlight and confinuity tester.

941RR Railroad Lantern Battery. Designed for rough, tough yard use. Exceeds specifications of railroads and U. S. Bureau of Standards. 3LP industrial Leak Proof Battery. Sealedin-steel. Gives longer usable bright light. Guaranteed against corrosion.

N22W8

"WORKMAN"

with signal wand. W8 unbreakable polyethelene 8" signal wand. Other wands 1¾" or 4½". Wands fit all standard Ray-O-Vac flashlights.







TIME AND EQUIPMENT SHOULD NOT BE "EXPENDABLE"

by H. D. Dorfman

Westinghouse Electric Corporation

As a designer of circuit breakers, I frequently listen to the age-old argument that "...fuses are expendable; we can afford to throw them away".

This point of view can be costly. Experience has taught maintenance men that the protection of circuits with fused devices is not a positive insurance against down time or damage. Important reasons for the better protection afforded by breakers are:

A. When one faulted fuse in a three-phase operation "blows", the other two may stay in. Costly damage can result when this causes single-phase operation. What this does to maintenance costs, as well as production continuity, is plain. An AB breaker opens all three lines when any one is faulted.

B. Accurate calibration of a circuit breaker assures its operating at exactly the rating for which it is installed. Without this accuracy, circuits may be opened due to harmless surge currents, or may remain "live" beyond the point of safety. In the one event, we have unnecessary stoppage; in the other, probable repair costs.

C. In either event, restoration of service is a matter of seconds with a circuit breaker, in contrast to the time involved in locating and inserting fuses.

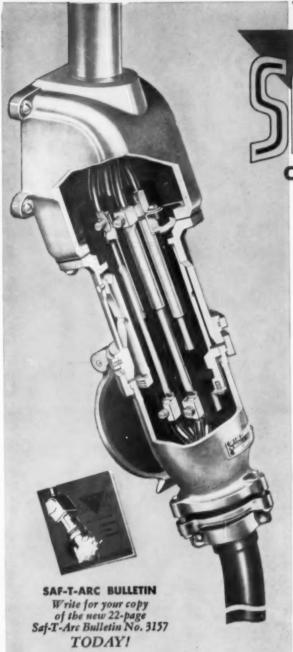
Suggests Checks on Quality

In my position as a design engineer, I am required to analyze our customers' experience with breakers under all kinds of operating conditions. I find customers served 20 and more years by the same AB breakers, more the rule than the exception. Based on this experience, I would advise anyone installing protective equipment, first of all, to make it circuit breakers. Beyond that, look for these specifications in order to get the most reliable protection with lowest maintenance potential:

Arc-quenching must be fast and free from flashover. The De-ion® principle is a good example, as it will extinguish an arc in less than ½ cycle. Insist on silver alloy contacts for low resistance and long life. The contacts we use have been proved "non-welding" by extensive tests.

Plating of parts can spell the difference between breaker "sudden death" and longevity. Westinghouse even plates internal copper parts of circuit breakers to assure long life where corrosion elements may attack. Make sure your breaker has a trip latch that is heat-treated after grinding and polishing. Specify a quick-make, quickbreak mechanism of the over-center toggle type for utmost reliability where breaker duty is severe.

If all of these points are checked "yes" on the breakers you choose, you will be providing yourself with the best that electrical engineering has developed so far. J-30258



SAFTARE CIRCUIT. LAKING

ŘECEPTACLES PLUGS CONNECTORS

... Assure Complete Safety
EVEN UNDER OVERLOAD!

Russell & Stoll has integrated many important design features into Saf-T-Arc, to keep pace with the advancing electrical needs of modern industry.

It will pay you to specify Saf-T-Arc... for safety's sake! These Type J devices not only assure complete circuit breaking safety under full rated loads—they're safe even when subjected to 50% greater than rated loads. Deep insulating chambers confine and snuff out harmful arcing and flashover by de-ionization and lack of oxygen—eliminating possible injury to personnel or plant equipment.

Units Are Individualized

Plugs fit only into receptacles or connectors having the same electrical characteristics. Two grounding arrangements are offered—one style provides grounding through a separate pole and receptacle and plug housing—while the other style provides grounding through the plug and receptacle housing only.

Quick and Easy Conversions

Conversions may be made in the field between the Weathertight Flap Cover and Waterproof Screw Cap assemblies—an exclusive R & S feature. Housings and component parts assemble readily. Regular service interior assemblies interchange quickly to create reverse service devices.

Saf-T-Arc supplements—but does not replace—the standard R & S Angle Type Lines widely used for many years.

4 Complete Lines

30, 60, 100 AND 200 AMPERES 600 VOLTS, A.C., 250 VOLTS, A.C. OR D.C.



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Straight Receptacle with Screw Cap



Angle Receptacle with Horizontal Bez and Screw Cap



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AC UNI-PACT HORNS Cat. No. 123-U Two-Way Projector

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Sperti Faraday delivers the latest *dependable* developments in sound and sight communication systems for business, industry, school, hospital, home. From a simple buzzer to the amazing Visicall system that can revolutionize hospital care, it's new and it's dependable if it's Sperti Faraday.

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C Cat. No. 185-AC — Cat. No. 186-DC



AC "CM" WIBBATING BELLS Cat. No. ATL-700



DC BUZZER-



UTILITY CHIME-Cat. No. 1531



AC WEATHERPROOF KODAIRE HORNS - Cat. No. 136



AC UNI-PACT KODAIRE HORNS - Cal. No. 133-S

Engineering Tip: You can save a lot of time and worry by calling on Sperti Faraday engineers for answers to your audio-visual communications problems. No charge. Just write for full information.

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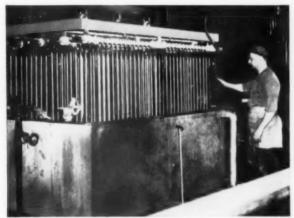
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these 4 **SPANGLEAM** features help you make better EMT installations!



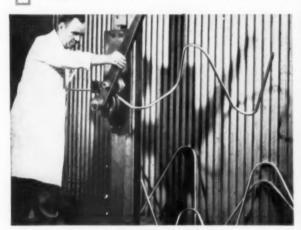
SPANGLEAM FINISH

First step is the application of a uniform electro-galvanized finish; then the tubing is dipped in the special-formula SPANGLEAM solution. Result: a bright, durable finish that has high corrosion resistance, makes an excellent appearance in exposed locations.



QUALITY TESTING

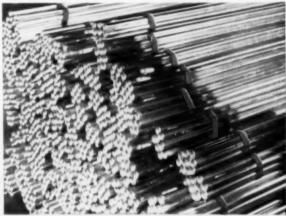
To be sure the SPANGLEAM finish more than meets UL requirements and Federal Government Specifications WW-T-806b, a random sample from each lot of SPANGLEAM is subjected to the copper-sulphate Preece Test. Any EMT that does not measure up is discarded. You get only the best!



MECHANICAL TEST

Sample lengths from each lot of SPANGLEAM produced are bent in all directions well beyond normal requirements to test weld and finish. Any rupture of weld or flaking of finish causes that lot to be discarded. Inspection is also conducted for uniformity of diameter, straightness and finishing.

Convince yourself that you can make fast, money-saving installations with SPANGLEAM EMT. Order SPANGLEAM for your next job from your local Spang Distributor.



SAFETY PACKAGE

SPANGLEAM EMT is bundled automatically for shipping in blue plastic tape. This tope assures a tight package, prevents individual lengths from slipping, provides easy handling, better storage and quick identification and inventory. Saves you time, prevents accidental



SPANG-CHALFANT

Division of The National Supply Company GENERAL SALES OFFICE: TWO GATEWAY CENTER, PITTSBURGH, PA. District Offices and Soles Representatives

EALL WESCO



KINDORF

continuous slot

saves installation dollars today
... and tomorrow!



Send for our product bullefin 0-1

—by providing a simple source of attachment anywhere along its length for hanger rods, brackets or bolted channel assemblies . . . attachments that can be added to, removed or adjusted at any time to meet changing requirements.

A PRODUCT OF STEEL CITY ELECTRIC COMPANY, PITTSBURGH 33, PA.



FOR EVERYTHING ELECTRICAL.



Here's all it takes

TO CONVERT THIS NEW WESTINGHOUSE COMBINATION LINESTARTER FROM NON-FUSED TO FUSED!

or change fuse clip ratings from 30 to 400 amp

This is flexibility!

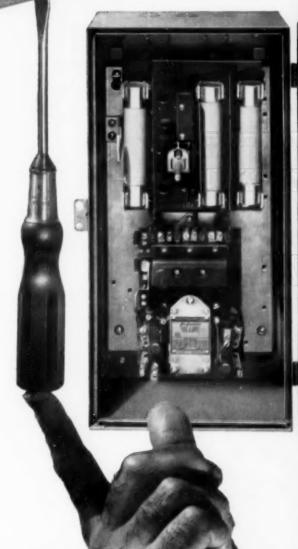
This is the new Westinghouse combination Life-Linestarter® with the Visi-Flex switch!... the convertible switch that enables you to modify the new Westinghouse combination linestarters (in sizes 0 through 4) to meet both your present and future power requirements by simply adding or changing a set of fuse clips.

All it takes is a screwdriver, a Westinghouse Fuse Clip Kit, and about five minutes of your electrician's time to change from non-fused operation to fusible, or to vary fuse ratings from 30 through 200 amps 600 volts, and 400 amps 250 volts, over a range of four switch sizes.

What's more, the new Westinghouse Life-Linestarters with Visi-Flex switch are up to 25% smaller than the old design—good news for plant engineers with a space problem.

For plants which face adverse operating conditions involving lint, dust, or oil seepage, the new linestarters are available in the NEMA-12 dust-tight enclosure, as well as the standard NEMA-1 shown at right. And—they're available now, from local warehouse stocks. Simply call your nearby Westinghouse sales office or distributor.

J. 30284



CALL WESCO STATE

Take a look at THE SMALLEST, LOWEST COST 100-amp BREAKER for 480-volt applications

This new Westinghouse EH Breaker represents a major breakthrough in molded case circuit breaker design. The 3-pole unit shown is 40% smaller than the industry-standard Type F Breaker (only 41/8" wide, 61/2" high and 3-31/32" deep). Rated at 100 amps, 480 volts AC, the new EH breaker will handle an estimated 95% of all 100-amp industrial breaker applications.

For fluorescent lighting circuits, the new Westinghouse EH design provides the first single pole breaker for 277 volt AC in ratings higher than 20 amperes.

In addition, a variety of accessories are available for the new breaker, including: shunt trip; alarm switch; vari-depth handle; rear connecting studs; and plug-in mounting blocks for switchboards.

For complete information on prices and application, contact your nearby Westinghouse Sales Office, or write: Westinghouse Electric Corp., Standard Control Division, Beaver, Pennsylvania.

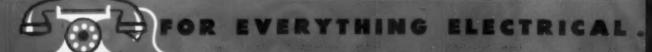
J-30282



ACTUAL BIZE. Full line of new, smaller Westinghouse EH Breakers includes: 100 amp, 480 volt AC, 2 & 3 pole—100 amp, 250 volt DC, 2 & 3 pole—100 amp, 277 volt AC, 1 pole.

YOU CAN BE SURE ... IF IT'S Westinghouse





FOR QUALITY

PRECISION THREADED, TOUGH
PERFECTLY FINISHED THIN WALL

E M T

FITTINGS

See or phone your
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Specify WAGNER
and get every desirable

working feature

COMPRESSION SET SCREW INDENTER FITTINGS

available in all types and sizes

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General Sales Office: 222 W. Adams St., Chicago 6, III.



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INSULATED CONNECTORS

THE NEW CONCEPT IN FITTINGS THAT REDUCES WIRE PULLING EFFORT UP TO 50%



Insulating Bushine



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Insulated Chase Nipple





Insulated EMT Connector



ELECTRICAL METALLIC TUBING



Insulated Tite-Bite Connector - straight



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FLEXIBLE CONDUIT OR ARMORED CABLE

*available soon

Look for the bright blue insulation

ANOTHER NEW T&B ENGINEERED EXCLUSIVE -

The First Line of Self-Insulated Raceway Fittings! Just look at the many benefits you get with these new "insulined" fittings.

They are the EASIEST to Install

Factory-assembled, the Insuliner is a permanent part of the fitting - it can never come loose or pull out. The slippery insulined throat cuts pulling effort by as much as 50%.

They make the SAFEST Installation

Because of the nationwide accent on safety, the trend is toward insulated fittings in all locations. Insulated bushings are standard fittings today. Extremely tough they are unaffected by common acids, solvents, moisture or fumes.

They make the MOST ECONOMICAL Installation

A one-piece fitting makes installation fast and easy for maximum on-the-job savings. There is no need to add a separate insulating bushing.

They give the Installation a QUALITY LOOK

Strong, longer bodies and heavy lock nuts... 100% visibility ... accurate threading ... all of the features you've come to expect in a T&B engineered fitting.

Write for free samples and technical data or contact your nearby T&B Distributor.

LOOK FOR THIS SIGN -



All T&B insuline fittings bear Underwriters Laboratories Approval

IT'S THE MARK OF AN AUTHORIZED T&B DISTRIBUTOR

The complete line of T & B fittings for conductors and raceways is sold only by recognized electrical wholesalers. It's our way of assuring you the service and savings of a friendly local source. Call him for all your electrical needs.

THE THOMAS & BETTS CO.

INCORPORATED

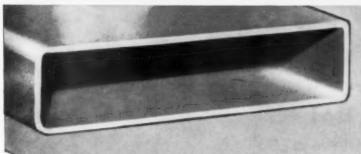
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34 Butler Street * Elizabeth 1, New Jersey Thomas & Betts Ltd., Montreal, P.Q., Canada MANUFACTURERS OF QUALITY ELECTRICAL FITTINGS SINCE 1898



WALKER HEADERDUCT...

saves contractor's time and owner's money



LARGEST

Walker Headerduct has a cross-sectional area of 8.75 sq. in. — the largest wiring capacity of any headerduct on the market. This means easier wiring for today's needs and more room for future expansion.

FAST, EASY LEVELING OF ACCESS UNITS

Access unit ring can be raised and leveled with the floor – even after concrete has set – without removing the cover plate. Positive 3-screw leveling affords up to %" adjustment.



LESS THAN A MINUTE TO BUSH HEADER-TO-CELL

Steel snap ring rolls in place quickly and easily, provides smooth bushing and secure fastening. No complicated tooling required.



Walker of Conshohocken

A MAJOR TIME SAVER— THE WALKER AFTERSET INSERT

A Walker one-piece afterset insert is placed in the cell opening and is crimped firmly in place in a matter of seconds with a drift-pin and hammer. Multiply time saved by one of these inserts times all service outlets and you have a major saving in time and money.

WALKER BROTHERS

Conshohocken 3, Pa.

UNDERFLOOR ELECTRICAL DISTRIBUTION SYSTEMS RIGID STEEL CONDUIT . E.M.T. . WIRE AND CABLE

CALL WESCO FOR

A NEW IDEA IN POWER DISTRIBUTION

WESTINGHOUSE

UNI-BUS

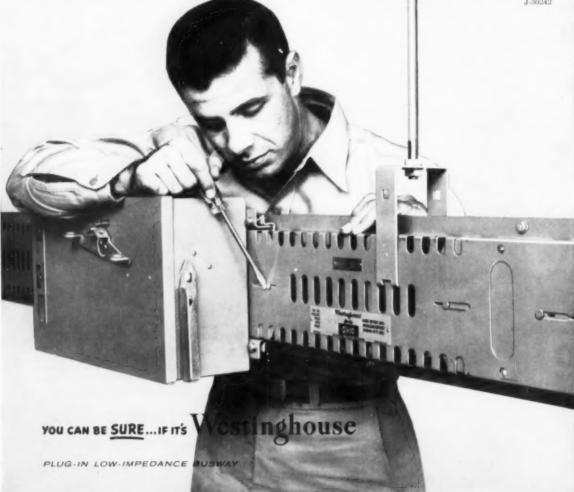
better because it's completely safe to use ...

It is impossible to touch live parts when handling Uni-bus, new Westinghouse power distribution system. The foolproof plug outlet (safety slide) cannot be opened until the plug-in device is fastened to the busway.

Even after the plug-in device has been secured to the busway, the slide remains closed. Thus, wiring can be made with all parts electrically dead. Not until the interlocked cover is closed and the safety slide opened (with screw driver, as shown) is electrical contact made.

For added protection, triple-wrapped insulation on all bus bars safeguards against any object making live contact through the ventilated openings. Lightweight Unibus is available now from Westinghouse, and features other exclusive advantages such as the flexible connector which simplifies layout and installation. Askyour Westinghouse distributor. Or write for booklet, B-7015. Westinghouse Electric Corporation, P.O. Box 868, Pittsburgh 30, Pa.

J-30242



FOR EVERYTHING ELECTRICAL



"DUAL-GRIP" ENTRANCE HEADS



Built-in connector clamp. Just tighten two screws on EMT or rigid conduit. No threads or fittings needed saves time!

GROUND RODS AND CLAMPS



The rods: Copper armor uniformly thick from tip to tip. Steel core and sharpened point for easy driving. Clamps are designed to go with the rods.



ENTRANCE ELBOWS

HEAVY DUTY CONNECTORS



Compact—easy to handle. Deep cut threadsweatherproof.



For all type connections. Priced far lower than split-bolt connectors . . . save up to 30% on larger sizes.



BRONZE GROUND CLAMPS

Complete line for 1/4" to 4" pipe. 3 types cover all needs. Swinging top for easy installation.

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BUCKEYE



CONDUIT

Whenever you call your Youngstown Distributor for Youngstown Buckeye rigid steel conduit, your order is made ready and tagged for fast delivery to you. Service is quick and sure—an important factor in helping you keep your jobs on schedule. Save time and trouble—call your Youngstown Distributor next time you need good steel conduit.

Manufacturers of Carbon, Alloy and Yoloy Steel

General Offices: Youngstown, Ohio - District Sales Offices in Principal Cities sheets - strip - plates - standard pipe - line pipe - oil country tubular goods - conduit and emt - mechanical tubing - cold finished bars - hot rolled bars - bar shapes - wire - hot rolled rods - coke tin plate - electrolytic tin plate - railroad track spikes



OR EVERYTHING ELECTRICAL

HOW Westinghouse

JOB-TAILORED FLUORESCENT LAMPS MEET YOUR LIGHTING NEEDS

...all with ULTRALUME™ High-Intensity Phosphors • MORE LUMENS PER WATT...
more light for your dollar • UNIFORM END-TO END LIGHT • PERFECT COLOR
MATCH...ALWAYS • MAXIMUM OUTPUT MAINTAINED THROUGHOUT LONG LIFE

New SUPER-HI Fluorescent lamps produce more than twice the light per foot. Designed primarily for high bay (20 feet or higher) industrial and outdoor lighting, a new line of extra high light output fluorescent lamps produce more than twice as much light output per foot as standard fluorescent lamps. The new SUPER-HI lamps permit extremely high energy loading of electrodes, the arc stream and the phosphor. This gives you high light output with new economy at good efficiency and long life. SUPER-HI lamps are light in weight, convenient to handle and provide a light source subject to the same easy optical control as with present standard T12 lamps, but with over twice the light output. Available in 105, 155, and 205 watts, 4, 6 and 8 ft. The lamps have a rated average useful life of 5000 hours, deliver 6000 to 13,000 initial lumens.

High Output Rapid Start lamps give more than 50% more light than regular type. Designed primarily for medium-high bay (15 to 20 feet) industrial and outdoor lighting, four new sizes of Westinghouse high output. rapid start fluorescent lamps can produce over 50% more light than comparable sizes of regular lamps and offer new economy and effectiveness to fluorescent lighting. These lamps provide increased lighting levels, make installations with adequate footcandle values of deluxe color light more practical, and improve the economy and practicability of fluorescent lighting at higher mountings and at lower ambient temperatures.

These lamps are available in 24", 48", 72" and 96" T12 design for general indoor use and for outdoor service where retention of light output at low temperatures is essential. The 72" T12 is recommended for street lighting.

Reflector-Fluorescent lamps produce 60% more directed light. For use where external reflectors are difficult or impractical to use, or where dirt deposit cuts lighting effectiveness, these Westinghouse Reflector-Fluorescent lamps provide a directional light distribution which helps put the light where you want it. This is accomplished by a built-in reflecting surface, extending the length of the lamp on the inside of the tube, which redirects about 60% extra light out the other side. Westinghouse Reflector-Fluorescent lamps are recommended for use in coves, showcases and other locations where space is limited. Indirect lighting effects may also be obtained by aiming the lamps toward the ceiling.

They also solve special lighting problems including temporary lighting for construction projects, displays, and exhibits.

Westinghouse Reflector-Fluorescent lamps are available in 40 watt rapid start, 48" and 96" T12 slimline types.

Beauty Tone" Home-line Fluorescent lamps with warm white deluxe color. The same new Westinghouse "Beauty Tone Home-line" lamps which are revolutionizing home lighting by providing warm white deluxe illumination are also ideal for offices, stores and wherever "friendly" color of light is wanted to flatter complexion, enhance the natural color of furnishings, decorations, and displays, and blend well with incandescent lighting.

There's a network of Westinghouse distributors ready to serve you. Call your nearest Westinghouse Supplier for a free Job-Tailored Survey of your lighting requirements. Or write Westinghouse Lamp Division, Bloomfield, N. J.

YOU CAN BE SURE ... IF IT'S Westinghouse





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When you call or send an order to WESCO, a lot goes on to make sure you get same-day delivery when humanly possible. The fact that it is humanly possible 89 percent of the time stems from the WESCO policy of stocking its vast variety of nationally known electrical products in or near your neighborhood.

In 132 branch offices, the WESCO tradition is . . . delivery where you want it when you want it. What's more, we can help with trained specialists to advise you on tough jobs that are looking a deadline in the eye.

Tear out this page and keep the number of your nearest WESCO branch handy. Or look in the classified directory under "Electrical Supplies, Wholesale and Manufacturer."

AS-575

WESTINGHOUSE ELECTRIC SUPPLY COMPANY

Practical Methods

Grading Frame in Spinning Mill Combines Three Lighting Sources

ILLUMINATION.

Broken or frayed fibers or any imperfections in weaving have little chance for remaining undetected when cloth is critically examined on a grading frame installed in the Ashboro, N. C., plant of Klopman Mills, since examinations are conducted with the aid of high-level back-, down- and cross-lighting.

The latter source (cross-lighting) is provided by means of a movable hand-held 150-watt R-38 unit which is connected via a self-coiling rubber-covered extension cord to a local plug-in receptacle provided on the frame for that purpose. With this lamp held at grading height and angle, intense highlights may be directed wherever desired.

The second source of illumination (concentrated down-lighting) is provided by means of a single 40-watt T-12 cool-white fluorescent lamp that spans the top of the inclined examination table, with the lower lip of the reflector positioned just high enough above the table surface to permit the cloth to pass beneath it. With the reflector tilted towards the front of the table, frayed fibers are clearly revealed to the inspector by this additional source of high-level luminosity.



LUMINOUS PANEL behind cloth provides high-level back-lighting source to detect weaving imperfections. Panel, consisting of two parallel ground-glass plates with air-gap between them, is back-lighted by nine daylight 40-watt fluorescent lamps.

Largest light source in the assembly, however, is the luminous panel located behind the cloth to provide a high-intensity diffuse source of illumination for overall inspection. This panel consists of two parallel i-in. thick ground-glass 4 by 5 ft plates (with a 4-in. airgap between them), with nine T-12 40-watt daylight fluorescent lamps (spaced on 7-in. centers) placed at a distance of 10 in. behind the rear of the two plates.

Multiple lighting sources are also

used to detect imperfections on the slasher, for there a movable handextension PAR-38 lamp is provided in addition to fixed position side lighting to facilitate the detection of broken or frayed fibers in this operational area.

Molded Resin For Cable Splices

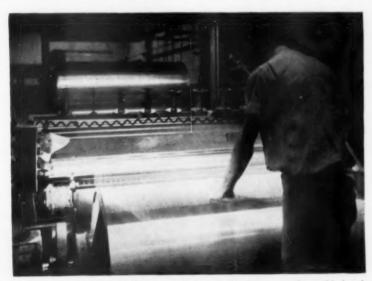
WIRING

Splices shot from a gun-new versatile method of protecting and insulating electrical splices with epoxy resin injected into a mold tailor-made in the field has been developed by Minnesota Mining and Manufacturing Co., St. Paul, Minn. Called the "Scotchcast" resin pressure splice, the new method is expected to find wide usage for both buried and aerial cable. Due to the versatility of the method, lead, rubber and plastic sheathed cable or even combination of these as well as shielded cable can be spliced. The method has worked satisfactorily on oil-saturated cable, the 3M company has reported.

The pressure splice method uses an open mesh screen-like tape as a spacer material, wrapped around the splice. This build-up of open screening is covered with a liquid-impervious plastic tape holding an injection fitting to allow entry of the resin into the splice. The plastic tape in turn, is covered with a low stretch tape to restrict the expansion of the plastic envelope when the resin is forced into the splice.

The adaptability of the new method allows the mold for the splice to be tailor made for each splice, providing moisture proof, void free, high dielectric strength insulation around nearly any size or shape of splice. Also it makes possible uniform quality splices in less time than previous methods and removes much of the factor of human error. The splices can be made by electricians without extensive special training or experience.

Resin for impregnating the splice is supplied in a plastic envelope which holds resin on one side of a dividing membrane and a hardener, or activator, on the other. When the divider is broken, the



BROKEN OR FRAYED FIBERS are detected on slasher by means of movable handheld 150-watt PAR-38 luminaire at end of self-coiling rubber-covered extension cord.



Metal Molding takeoff from run of NE Surfaceduct. Note how Metal Molding has been fitted to the rooms' rounded cornice. All National Electric surface raceway systems are designed to be inter-connectable.

neat and fast

When you have wiring modernization jobs in office, commercial, institutional or industrial buildings, National Electric Metal Molding can give you a neat surface wiring system that goes in fast.

You just fasten the base, lay in the wires and snap on the capping. No fishing is necessary! And NE Metal Molding can be bent around columns, chair rails and other offsets without buckling.

When you're through, the tenant has a neat, safe, permanent system that can be quickly added to or changed.

On your next modernization job try NE Metal Molding . . . it pays.

Listed by Underwriters' Laboratories Inc. Write for Complete Information

National Electric Products

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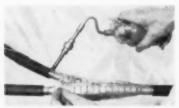




CONDUCTORS are spliced with suitable connector and outer insulating jacket is scraped clean.



OPEN-MESH TAPE is wrapped over entire splice area to provide a thick porous covering, allowing space for resin to penetrate to all parts of splice.



CONTINUITY of metal cable shielding is made by wrapping with aluminum foil tape from shield to shield and then soldering bare jumpers between original shielding.



MORE MESH spacer tape is used to bring the splice to required thickness, then vinyl tape is wrapped over the splice to hold an injection fitting in place and to form a liquid-impervious jacket on the splice.

resin and activator are mixed by squeezing the ends of the container forming a resin which sets up or cures through internal heat.

In preparing the splice, the insulation is first scraped to remove all wax, oil and dirt. The conductors are then fastened together with a suitable connector and the splice is wrapped with the spacer tape to the proper splice diameter. The plastic injection fitting with its one-way, non-return valve is positioned at the proper point on



GARCY Fixtures are designed with the Contractor in mind!

Says Mr. Edward R. Hansen, President, Meade Electric Company, Inc.

"Not only does the new Garcy Ultra-Lux give good lighting, but it's easy to install with its light-weight chassis and one-piece plastic shield."



Ultra-Lux lighting at the Chicago Printed String Company

Garcy Ultra-Lux, with its shallow profile is ideal for low ceiling lighting. Only 3¼" deep, surface-mounted Ultra-Lux gives the appearance of a recessed fixture. Yet, the depth is consistent with good light distribution and brightness control.

Ultra-Lux has two basic parts—the completely assembled chassis and separately packaged shield made of Koppers EVENGLO*, guaranteed not to warp or discolor.

*EVENGLO is a registered trade mark of Koppers Company, Inc.

GARCY Lighting's New One-Level Plant Means Better Service at Lower Cost

New plant, new equipment and streamlined production techniques now enable Garcy to produce high quality fixtures in greater quantity.

More warehouse space also makes it possible to maintain greater stocks of all standard fixtures. This means prompt service to meet job deadlines.

More than ever before, contractors can depend on Garcy quality and Garcy service ... your best source for all types of commercial lighting.



Garden City Plating and Manufacturing Company 2475 Elston Avenue • Chicago 47, Illinois

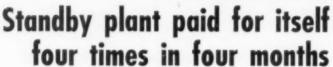
In New York City—48 West 48th Street
In Los Angeles—Garcy Western Corporation, 3912 Broadway Place
In Canada:—Garcy of Canada, Ltd., 1244 Dufferin Street, Toronto



NEWS







"Couldn't operate without this protection", says C. G. Young of the Hiawassee Hatchery

Sleet, lightning, wind and snow . . . each took their turn at knocking out the high-line serving the Hiawassee (Georgia) Hatchery. Power was off for periods ranging from 2 to 7 hours. Each time, the Onan CW Standby Plant started automatically and took over the power load . . . operating all essential equipment and preventing any loss whatsoever.

Standby protection at lower cost

Onan air-cooled plants like the CW model shown here, cost substantially less than water-cooled units of similar capacity. Onan's exclusive Vacu-Flo cooling system permits using these lower-cost, air-cooled units where previously it would have been necessary to use water-cooled plants or to install elaborate ventilation equipment. Vacu-Flo models range from 1,000 to 10,000 wats... water-cooled from 10,000 to 75,000.



Automatic operation . . . This Onan line transfer control starts the electric plant when power is interrupted and switches current to all essential hatchery equipment. Plant stops automatically when power is restored . . . protects hatching stock at all times.

Models for homes, farms, industry. Write for information on dealerships.

D. W. ONAN & SONS INC.

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ELECTRIC PLANTS . AIR-COOLED ENGINES . GENERATORS . KAB KOOLER



A FABRIC WRAP is applied to the splice to provide strength against the pressure of resin injection.



A RESIN GUN is trigger-operated to inject the quickly prepared resin under pressure into the splice assembly through the injection nozzle.



CUT-AWAY VIEW of a completed splice shows all of the splice elements completely imbedded in the solid resin mass (resin even penetrates spaces between conductor strands).

the splice. The plastic tape envelope is wrapped over the apron of the injection fitting to secure it firmly in place, wrapping away from the fitting to the ends of the splice forming a liquid-tight container for the resin. Over the plastic tape a layer of fabric tape is wrapped to give the stretchy plastic added mechanical support against the pressure of the resin. The last layer of fabric tape can be compared to an automobile tire while the plastic tape is comparable to the inner tube.

With the fabric tape secured, the pressure gun is prepared. Similar to a caulking gun, it holds the "Unipak" container which acts as a disposable liner to eliminate cleanup. First a plastic nozzle spout is

More features at your call at the lowest price of all AMPROBE RS-1 only 3985

See only one scale at a AMP Se

RS-1 — the volt-ammeter with the most-used ranges

There's one for every job and every budget.

The new RS-1 is one of the 14 AMPROBE models priced from \$19.85 to \$67.50.

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1. INGENIOUS ROTARY SCALES. 4 current ranges, 2 voltage ranges—each on a scale of its own!

2. ONE HAND OPERATION! Range selector knob is next to your thumb.

3. NEW MAGNIFIED DIAL...LONGER BCALE LENGTH. Greater visibility, greater accuracy, than ever before.

4. POINTER-LOCK "FREEZES" POINTER AT READING. Use the RS-1 any piace your hand can reach. Needle can be locked in place so that you may read it away from conductor. OTHER ADVANCED ENGINEERING FEATURES: Range-selector knob is recessed so that it can't be moved accidentally. Simple bayonet leads lock in at bottom for quick connecting. Impact-proof case with non-slip ribbing. Advance printed circuit construction. Shielded core magnetic movement. Leather carrying case can be worn on your belt. Amprobe, a division of Pyramid Instrument Corp., Lynbrook, New York, manufacturers of famous REMCON simplified low-voltage Hi-Fashion switching devices.

than any other test instrument of its kind!

don't guess at it; AMPROBE IT!

ELECTRICAL CONSTRUCTION AND MAINTENANCE . . . NOVEMBER, 1957

Blackhawk's NEW One-piece Box Support

Speeds up work

A single piece that goes in easily and stays put — frees the electrician's hands for the work.

Quick

The Blackhawk patented one-piece box support is installed all at once — permits more jobs, more profits.

Permanent

The Blackhawk box support provides rigid, unified support because it is a large, single piece — does not wiggle or saw, because it is parallel to the wall.

Superior installation in seconds



Ask Your Electrical Distributor

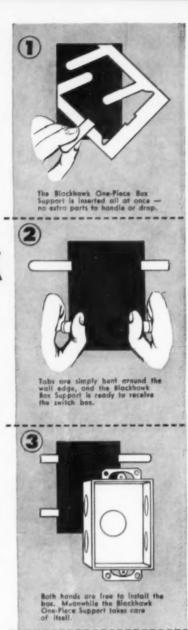
Cat. No. 540 Patent No. 2518912

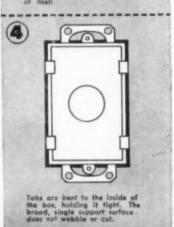
Specify B-I when you buy!

BLACKHAWK INDUSTRIES

DUBUQUE, IOWA







pressed to the side of the "Unipak" by its adhesive back. Then the contents of the "Unipak" are mixed by squeezing. After it is thoroughly mixed, the "Unipak" is inserted in the gun with the plastic nozzle spout protruding from the gun spout. A puncturing tool (included with the gun) is pushed through the nozzle, puncturing the container wall. The nozzle is inserted in the injection fitting on the splice and the trigger worked to force resin into the built-up mold. Small air holes are punched in the splice casing at the ends farthest from the injection fitting. When resin begins to drip from these pin-holes, the splice is fully impregnated.

According to the manufacturer, the new method is adaptable to almost any kind of splice and the required insulating values may be regulated by increasing or decreasing the thickness of the spacing buildup.

Because of the custom-made nature of each splice, shielding for shielded cable can be made continuous through the splice by running it through the spacer tape buildup. External groups may be attached before applying the spacer tape and parallel exit of cables from the splice can be arranged by padding cables into place with insulating putty before beginning the splice.

Assorted Lighting Techniques Accent Motel

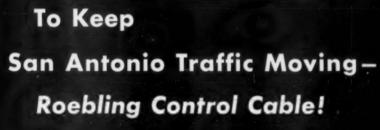
ILLUMINATION

The 3-A-recommended Driftwood Motel in Miami Beach, Fla., offers guests a combination of comfortable sleeping accommodations, excellent dining facilities, a spacious lobby for enjoyable relaxation, under-cover parking provisions plus such additional services as television, radiant heating and the like. It also offers a wide variety of comment-provoking lighting treatments, exterior as well as interior, with incandescent and fluorescent sources combined in a coordinated attention-commanding illumination plan.

For example, luminous signs atop brick pylons and towers are internally lamped to advertise the motel's name, while these pylons themselves are floodlighted by strategically-placed PAR lamps located on lower set-backs or shielded by architectural features of the building. Fluorescent-backlighted translucent glass panels are also used to add











Nonhygroscopic plastic fillers prevent wicking,

Mylar nonhygroscopic binder tape provides extra electrical and mechanical protection.

PVC jacket resists moisture, abrasion, oil, road chemicals, flame. Roebling Control Cable was easy to pull because of the low coefficient of friction of Its PVC jacket. Palyethylene insulation has exceptional electrical properties...it's the best available plastic for use in AC-DC control circuits!

> PVC caverings over individual conductors have permanent bright colors, lend extra chemical and mechanical protection.

San Antonio, Texas, city engineers took a long look at traffic-control systems all over the U.S. before deciding on the control system ideal for San Antonio. Roebling Multi-Conductor Control Cable plays a key role in this intricate new system.

Roebling was the ideal choice! Here's why: Outstanding electrical characteristics, including high dielectric strength, low electrical loss, outstanding electrical stability in moisture . . . superior resistance to road chemicals, oil . . . a smooth, rugged, easy-to-strip vinyl sheath . . . and perfectly insulated conductors with bright, permanent colors. What's more, this Roebling Cable is simple to splice. It's adaptable to tying in to terminal blocks—the time-saving installation method used in the San Antonio system. There is no current leakage due to dampness at the terminals.

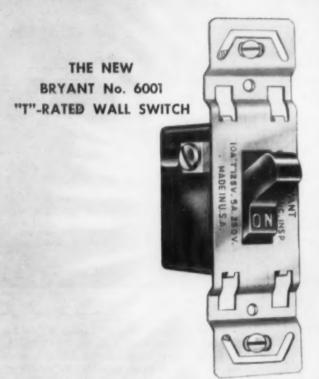
Roebling Control Cable is better for control systems of every type. Learn more about the long-term dependability and economy of Roebling Cable by writing Electrical Wire Division, John A. Roebling's Sons Corporation, Trenton 2, New Jersey.

ROEBLING



Branch Offices in Principal Cities - Subsidiary of The Colorado Fuel and Iron Corporation

Built to last a house-time



For economy plus Bryant dependability try this switch on your next job. It fills the bill for most residential installations.

COMPACT — plenty of wiring room STRONG — built to last a house-time

HANDY — captive mounting screws make installation easy

SAFE — fully enclosed operating parts

STURDY — large yoke with more exposed plaster-ear area

Available now at your Bryant Distributor.



Ne. 5242, 5262 grounding duplex outlets. Bryant's exclusive design salves breakage problem on grounding terminals. Made of sturdy plastic in brown or ivory. NEMA and ASA Standards.

... the new "T"-rated switch from BRYANT

SUPERIOR WIRING DEVICES

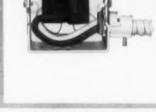
Bryant introduces the newest addition to its complete line of moderately priced wiring devices. It's the new Bryant No. 6001 wall switch. Available with brown or ivory handles . . . single pole or 3-way. This new switch gives you the Bryant name . . . Bryant quality at competitive prices. Now — more than ever — you can wisely use Bryant on every job you wire. Bryant's broad, complete line of wiring devices is designed to meet the specific

needs of contractors and electricians on every job. Greater versatility . . . faster, easier installation . . . highest quality. And Bryant not only meets but exceeds Federal and Underwriter Laboratories Standards. Make Bryant first choice . . . there's no need to change brands or distributors from job to job.

See the new No. 6001 at your Bryant Distributor. Let him supply *all* your wiring needs.

Complete the job with these quality Bryant devices . . . BUILT TO LAST A HOUSE-TIME









Ne. 6142 duplex eutlet. Floating double-sided contacts grip both sides of cap blades. Spring grip terminals make hook-up easy. Rated 15 amps, 125 v. Made of sturdy plastic in brown or ivory.

Ne. 9303 three-wire pelarized connector. Clamp-type pressure terminals make fast, sure contact. For dryers, built-in range, commercial cooking. NEMA and ASA Standards, rated 30 amps, 250 v.

No. 9306 heavy-duty three-wire flush-mounted polarized connector. Pressure-type, recessed terminals give fast, sure contact. Accommodates No. 6 wire, mounts in single gang box. Rated 50 amps, 250 v.

No. 3830 three-wire polarized cerd sets. Rated 50 amps, 250 v. Flat, molded cord with two No. 6 and one No. 8 wire. Non-removable molded plastic cap. Ideal for major appliances. Perfect match for No. 9306 connector.

THE BRYANT ELECTRIC COMPANY BRIDGEPORT 2, CONN. • CHICAGO • LOS ANGELES





GAIN MORE FREE TIME WITH THE NEW G-E

EASY-TO-WIRE METER SOCKET

It's fast to wire and easy tooinstalling the new, improved General Electric S-1 square meter socket is a snap. Comes with lay-in terminals and plenty of knockouts —an electrician's delight. And versatile! Your choice of one, two or no hubs. Priced right too! Get

details from your G-E Distributor or WRITE FOR FREE BUL-LETIN GEA-6563, G.E. Co., Schenectady 5, N.Y. Sec. 625-8.



GENERAL & ELECTRIC



MIAMI MOTEL uses light in wide variety of treatments as attention-attracting decorative medium, with incandescent and fluorescent sources combined to floodlight, highlight and backlight various architectural features of the building.

lighting interest to the exterior of the building, and PAR-38 lamps equipped with color rondels focus attention upon surrounding shrubbery and flower plantings.

Also visible from the outside are semi-recessed downlights on undersides of entrance-overhanging porticos; recessed 3-lamp glass-bottomed fluorescent troffers that illuminate the wide auto entrance, and (through the all-glass windowwalls), recessed R-30 downlights and a variety of ornamental chandeliers in the spacious lobbies of the motel.

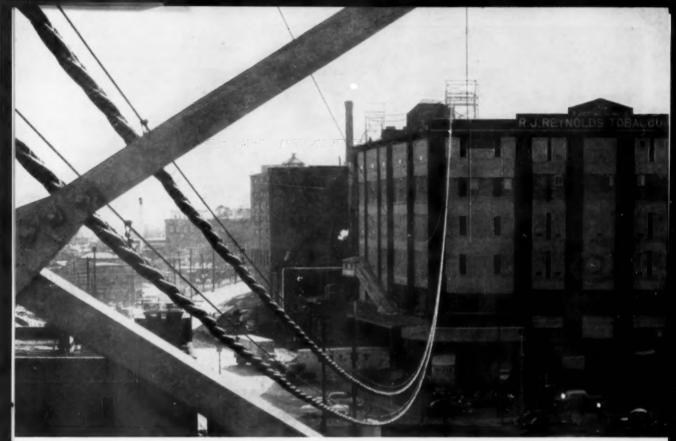
In-Built Lighting Fixtures for Candy Shop

ILLUMINATION

Lighting treatments as individual and decorative as the packaging of Mary Bell Candies are employed to add glamour to this Atlanta, Ga., shop where ceiling coffers, luminous wall plaques, chandeliers and show-



SPECIAL SQUARE lighting mediums in ceiling and wall corners lend visual interest to this compact candy shop where additional methods of illumination range from period chandeliers to modern fluorescent striplights above recessed wall display cabinets.



Okolite-Okoprene aerial cables furnish a low-cost route for increased power demands over a span of 420 feet between buildings.

More power the low cost way ...with Okolite-Okoprene aerial cable

To meet the power demands of increased cigarette production, The R. J. Reynolds Tobacco Company of Winston-Salem, North Carolina, recently installed the two Okolite-Okoprene aerial cables shown here. An operating voltage of 15kv and a span of 420 feet across two open primary lines and railroad sidings called for aerial cables with maximum reliability. Okolite-Okoprene self-supporting cable was used, with extra messenger for added safety.

Here is another case where an Okonite self-supporting aerial cable solved an increased power-demand problem simply and economically. The overhead route often costs much less than the underground route... and it can be just as safe, too, when you use dependable Okolite-Okoprene cable. Recommended for general use up to 35kv, Okolite-Okoprene is insulated by Okonite's exclusive strip process and (if rated at over

2kv) inspected inch-by-inch on the Gooding Test Train.

Okonite is the only manufacturer making cables by all insulating methods: strip, extrusion, tape or dip. Thus we are in the unique position of being able to recommend to you without prejudice the one cable which most closely meets your requirements. The Okonite Company, Passaic, New Jersey.



where there's electrical power . . . there's OKONITE CABLE



case striplights are combined to attractively display the taste-tempting confections of this modern retail outlet.

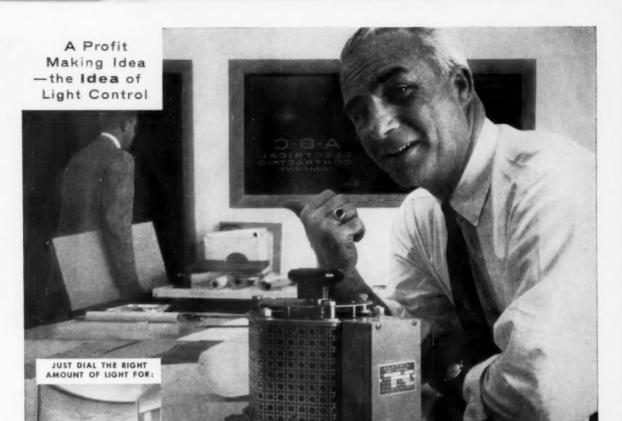
Ceiling coffers are square-domed recesses indirectly illuminated by twin 100-watt IF incandescent lamps shielded by polished metal semispheres. Coffers and frames, spaced on 3-ft 9-in. centers in both directions, are painted white and are set in a ceiling of light grey. Light grey is likewise used in combination with natural wood panels as the predominant wall treatment, while natural wood display cases are fronted by tan-and-brown patterned rubber-tiled flooring—all with good reflectance factors.

Corner panels, also square in contour, consist of translucent plates; each separately backlighted by three 30-watt T-8 cool-white fluorescent lamps. Architectural interest of panels is furthered by the addition of central squat wooden pyramids, while ornamental framing and immediately-adjacent wall areas are also attractively constructed of natural grained veneers.

Chandeliers are variously 3- and 6-lamp low-wattage incandescent luminaries, while top-lighting for wall cases consists of 20-watt white fluorescent tubes mounted end-to-end in single rows behind shielding and diffusing translucent bottom panels. Several ornamental double-arm brass-and-plastic lamps, placed atop main display cases to highlight boxes of candies offered to customers for closer inspection, complete the lighting arrangement in this relatively small (18- by 25-ft) shop.



HOLLIS CANNON, president of Badger Electric Co., Madison, Wis., is shown at his desk catching up on some "paper work".



Non-interlocking LUXTROL Type D2000 is shown in picture above

LUNCH, COCKTAILS, DINNES

TYPE OF MEETING



"He Switched-from Switches to LUXTROL - and I made \$1000 Extra!"

"I'm glad I talked LIGHT CONTROL instead of old-fashioned switches. Now he's sold on the idea - and he'll sell others for me."

Yes, you do make more money when you talk LUXTROL light control equipment. Your customers benefit, too, when you install this modern idea in lighting. Owners of cocktail lounges and restaurants find all-level lighting can set the right mood at the right time. Patrons linger - and spend more - or hasten to make room for others. Business executives want controlled light in their offices and conference rooms. It helps merchants build better displays and create an attractive traffic-building atmosphere. In churches and funeral homes it becomes part of the service. Schools, hotels, homes, theatres, auditoriums, motels - you'll think of many more.

LUXTROL light control equipment can be used with incandescent, fluorescent and cold cathode lamps. Simple to install. See your Electrical Distributor or send coupon for full information.

Control Equipment











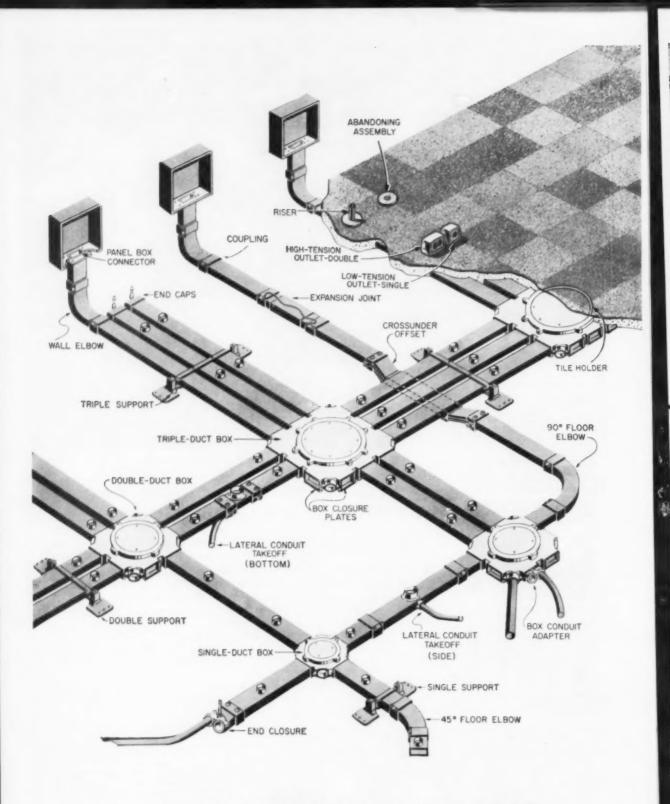
a precision product of

SUPERIOR ELECTRIC

511 ROSER ROAD, BRISTOL, CONNECTICUT

Company

Zone_State_



General Electric's new single-level steel underfloor wiring system provides a low-cost but efficient means of handling both feeder and branch circuits. The simple, flexible design permits installation under any conventional floor layout without special adaptations.



NEW SINGLE-LEVEL STEEL underfloor wiring system

For all types of floor constructions...can be used in fills as shallow as $2\frac{1}{2}$ inches

You have a complete choice of steel underfloor wiring systems from General Electric: The G-E cellular-steel floor system . . . the G-E two-level steel system . . . and now General Electric's new single-level steel system.

This addition to the G-E line of steel underfloor systems is designed for standard floor layouts where the greater flexibility of the two-level system is not required, or where fills are too shallow to accommodate other systems.

General Electric engineers have designed this system for easy installation—box and duct leveling is done quickly with a screw driver . . . slip couplings simplify duct connections . . . and wire pulling is a fast job because the galvanized ducts have smooth, organic-coated interior surfaces.

The standard-size steel ducts (3.357 sq inches) provide adequate feeding and distribution capacity. Single, double, or triple runs of duct can be used

according to the number of services needed.

All three General Electric steel underfloor wiring systems are listed by Underwriters' Laboratories, Inc.

When to Use the G-E Single-level System

Consider these factors before choosing an underfloor wiring system for your next project: a. Can a standard floor layout handle feeding and distribution? b. Is the floor fill less than $3\frac{1}{2}$ inches? c. Can a single-level system fulfill future wiring requirements?

If so, you should consider this new General Electric single-level steel system. However, for other applications investigate G-E cellular-steel floor and two-level systems. Whatever your needs. General Electric's experience and complete product line can provide your best answer. Call your nearest General Electric Construction Materials district office or write Section C77-1118, Construction Materials Division, General Electric Co., Bridgeport 2, Conn.

Progress Is Our Most Important Product

GENERAL (ELECTRIC



NOW from Allis-Chalmers

Pushbutton stations designed to withstand even the most

Here is one of the most practical developments to come along in recent years—Allis-Chalmers heavy duty push-button stations. From the phenolic BM-2498 enclosure to the Type 316 stainless-steel hardware, this line of pushbutton stations is exceptionally resistant to corrosive action of chemicals.

For the first time a proven-in-service, roll-action operator is completely protected by a rugged, corrosion-resistant enclosure. This assures longer, trouble-free operation in chemical plants, refineries, paper mills, or any industrial application where corrosive atmospheres normally cause pushbutton failures.

The complete line of Allis-Chalmers corrosion-resistant pushbutton stations includes:

- · single or two-button units
- · momentary or maintained contacts
- lockout attachment
- · pilot lights



This newly designed pilot light has the same phenolic enclosure as the pushbutton stations, and is available as either single or double units. Wide angle lenses of flexible vinyl plastic have greater range of visibility, and are available in any combination of red, green, amber, blue, or white. Bayonet-type bulbs are used to resist shock. Primary voltages are to 550 volts; secondary voltage is 6.3.

For further details call your nearest A-C District Office or Distributor . . . or write Allis-Chalmers, General Products Division, Milwaukee 1, Wisconsin.



ALLIS-CHALMERS

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Product News



Substation Transformers

New substation transformers are available in ratings through 15 kv, 250 to 500 kva, single phase. Featuring a wiring design which distributes surge voltages more evenly, the transformers have a core which achieves maximum utilization of tank space. Additional features are: simplified bushing mounting, added resistance to voltage breakdown, and flat fin coolers to reduce installation area.

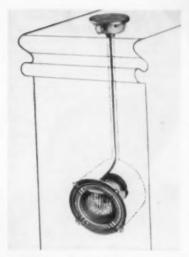
Westinghouse Electric Corp., P. O. Box 2278, Pittsburgh, Pa.



Floodlight

(2)Specially designed Alzak processed aluminum reflector and a fresnel lens are features of a new floodlight designed for protective lighting around factories, oil refineries, airports, etc. Providing a 180 degree beam, these No. 200F floodlights are dust-proof and weather-proof while their aluminum castings with non-ferrous latches, springs, and screws provide a substantial housing for the heat resistant Fresnel lens. Units are designed for use with 300- to 500watt incandescent lamps or 4000 to 10,000 lumen series lamps, although they will also accommodate mercury vapor lamps from 100 to 250 watts,

Nepo Manufacturing Co., 4230 North Sayre Ave., Chicago 34, Ill.



Swimming Pool Light

A new underwater swimming pool light available with either 300- or 500-watt reflector spot lamps. It is designed for wet niche installation in concrete, tile, metal, Fiberglas, or plastic pools. The one-piece cast aluminum alloy body is specially treated to give complete protection from all pool chemicals. Relamping can be done without lowering pool water level. A selection of mounting styles and colored lenses is available with underwater floodlights.

Revere Electric Mfg. Co., 6009-17 Broadway, Chicago 40, Ill.



A new solventless vinyl adhesive by the name of Epocast 126 is particularly suited to the application of vinyl sheets to steel, aluminum, masonite, wood, and other surfaces. Able to bond both rigid and semirigid sheets to concrete, metals, etc., this material is classified as an epoxy adhesive of special formula-

Furane Plastics Inc., 4516 Brazil St., Los Angeles 39, Calif.



Lighting Fixture

New square 60-watt recessed lighting fixtures have been added to the Atlite line. Housings are offered in three styles: unwired, unwired with an asbestos lining, and completely prewired. All units are equipped with fibre glass gaskets to seal out light leakage. Each frame can be equipped with any of six separate lenses; Skytex, Alba, Fresnel, Ferlux, drop lens or a bent lens. Also a choice of finisheschrome, copper or brass plating; white or gray paint; aluminum or black anodized.

Atlas Electric Product Co., 319 Ten Eyck St., Brooklyn 6, N. Y.



Timers

Model 801 repeating timers now offer dial cycles ranging from one revolution per minute to one every hour with flexibility in On-Off programming. The timers are recommended for use wherever a given operation, or series of operations, must be repeated at scheduled intervals. The unit makes possible the setting of varied schedules within a fixed time cycle. In addition to single-operation control, it allows for the setting of many schedules within the single dial revolution period.

Tork Time Controls Inc., Mt. Vernon, N. Y.

SERVICE ENTRANCE HEAD

NEWLY DESIGNED HOOD

gives more wiring room
— in height, width and
radius

Fitting embodies a cadmium-plated, certified malleable iron body, with a pressure cast aluminum hood, for maximum strength and protection

HEX-HEAD SET SCREW

(with screw driver slot) prevents head from turning, by direct conduit-tohub gripping action

LONG

prevents rain from entering conduit

Sizes:

Available with slip hubs to fit all standard conduit sizes from ½" through 2". Sizes 1½" and 2" equipped with two set screws.

FORMED STEEL ADAPTER

Fitting comes equipped with formed steel adapter for perfect centering on thinwall Installations. Adapter is discarded when head is used on rigid THIS NEW HEAD is designed for either rigid or thinwall application. It provides easier and faster installation, because no threading or external clamping is required. Set screw fastener assures firm and positive head support.

Here is another Midwest development in providing quality fittings. "Quality" is just a condensed way of saying: "Getting the total job done—right—with the most inexpensive combination of material and manhours." Engineering and producing quality fittings to meet the highest standards of electrical wiring requirements, is our objective at Midwest.

Midwest Electric Myg. Company

MANUFACTURERS OF ELECTRICAL WIRING PRODUCTS

Chicago 12, Illinois





Enclosure

A new, compact "handle through cover" enclosure for G-E 2- and 3-pole plug-in Type TQL circuit breakers. With 240-volt ac, 10 through 50 amp 2- and 3-pole Type TQL circuit breakers, the device can be used for individual or centralized control of equipment. It can be used as a main disconnect for remotely located branch circuit panels and to protect insulated conductors in feeder and branch circuits from overcurrent. Enclosures are furnished for either flush or surface mounting in a light grey Bonderized finish. They feature insulated groundable neutrals, spacious wiring gutters and a padlock locking shelf.

General Electric Co., Plainville, Conn.



Pipe Machine (8

A new lightweight power drive for hand pipe tools, called Oster "100". It has a full 2-in. standard pipe range and up to 12-in. diameters using a special drive unit and geared tools. It is suitable for oneman handling and operation. Machine can be mounted in a variety of ways. In addition to the hinged, folding stand, it can be bolted directly to work bench or clamped on a truck, bench or other suitable mounting by means of a special "C" clamp attachment. Dimensions are 12 % in. high by 13 % in. wide by 14 % in. long.

Oster Mfg. Co., E. 289th St., Wickliffe, Ohio.

Conduit Fittings (5

With the five new Ideal-Simplet Universal body styles and 35 hubcovers, with varying hub arrangements, approximately 12,000 different conduit fittings can be made. This type of fitting allows complete revision of hub arrangement without dismantling wiring system. Bodies and hub-covers are made of malleable iron with heavy cadmium plated finish. Hubs have precision tapered pipe threads and conduit stops. Gasketed covers and blind end screw holes seal out moisture, coolants, dust, etc.

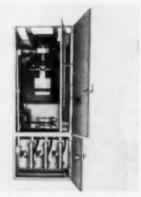
Ideal-Simplet Fittings, Inc., 1041 Park Ave., Sycamore, Ill.



Bus Structure (10)

The 4.16, 7.2 and 13.8 kv 1200-3000-amp non-segregated phase bus is completely sealed with cork neoprene-gasketed split half round covers. Bus is insulated by air and porcelain insulators. Ideally suited for generator leads to transformers, for connecting transformers to switchgear assemblies, for interconnecting switchgear assemblies, and for distribution of light and power in factories and office buildings. Other features include flexible or laminated connectors. Circular design requires less space for installation.

I-T-E Circuit Breaker Co., 19th & Hamilton Sts., Philadelphia 30, Pa.



Motor Starter

(11)

A line of 2300 to 4160-volt starters (type H) for full or reduced voltage starting, reversing or nonreversing, dynamic braking or multi-speed control of squirrel-cage synchronous or wound rotor motors is now available. Completely front accessible, the starter is compact and versatile. The basic unit measures 34 in. wide by 32 in. deep. The starter is available with either air break or oil immersed contactors up to 1500 hp at 2300 volts or 3000 hp at 4600 volts. Short circuit protection of 150,000 kva at 2300 volts and 250,000 kva at 4160 or 4600 volts is provided by current limiting

Allis-Chalmers Manufacturing Co., Milwaukee 1, Wis.

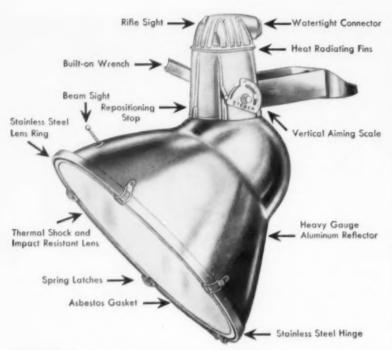


Pilot Light

(12)

A new design incorporating the features of the Class 9001 Type T pilot light line, with a separate circuit to test the bulb. The push-to-test pilot lighting enables the testing of bulb by pushing on color cap. The oil-tightness of unit is maintained in both normal and depressed or test position. All internal connections are pressure connections of silver-plated beryllium copper. Units occupy same panel space as standard Type T pilot light and can be mounted adjacent to one another.

Square D Company, 4041 N. Richards St., Milwaukee 12, Wis.



NEW "SERIES 4000" SPORTS AND INDUSTRIAL FLOODLIGHTS HAVE ALL THE FEATURES YOU WANT!

You can pay more, but you can't buy better floodlights!

Steber floodlights meet any and all job requirements! They provide efficient, economical high intensity illumination for sports areas of all kinds, parking lots, protective and working light for industrial plants, railroad yards and construction jobs.

Steber floodlights are easier to install, easier to wire, easier to aim. Exclusive ANODAL processing gives the heavy gauge aluminum reflector a smooth, glass-hard, ageless finish inside and out. You get higher efficiency, easier maintenance, better looking installations.

Steber "Series 4000"
Floodlights meet NEMA Specifications FL 6-210 for general purpose enclosed floodlights 300 to 1500 watts and 400 watt mercury vapor lamps.

Write for new Steber "Series 4000" literature today.



Lighting Units STEBER for Every Need

STEBER MANUFACTURING CO. . Dept. 98, Broadview, Illinois

STEBER MFG. CO. OF CALIFORNIA, Inc. 242 So. Anderson St., Los Angeles 33, Calif. STEBER-WOODHOUSE, LTD.
33 Ingram Drive, Terente, Canada

SOLD THROUGH LEADING DISTRIBUTORS



Circuit Breakers

(13)

Two new units in a series of improved molded case AB circuit breakers have been announced. Improved design has contributed to space-saving, higher electrical capacities, simpler installation and lower unit costs. The new 3-pole 480-volt breaker, type NEF, is supplied with ratings from 15 to 100 amps ac and is able to withstand short circuit currents of 10,000 amps. The new single pole 120-volt breaker, type NEW, is supplied in rating of 15 and 20 amps. They are listed by UL.

Federal Pacific Electric Co., 50 Paris St., Newark 1, N. J.



Time Punch

(14)

The newly announced IBM 8200 time punch will save a time clerk an estimated ten hours a week or more processing the attendance cards for 1200 employees. The work of the time clerk and key punch operator is done automatically. The 8200 will be available in two basic types. The time punch, as used in attendance time applications, will produce IBM punched card records of IN and OUT registrations of employees, identifying the day of

the week, hour and hundredths of hours in addition to an "on-time" designation. Another model, the Time-Data Punch, for job cost applications, will punch START and STOP times, and in addition variable data such as employee serial number, job number, etc. The variable data is determined by manually set levers. After a card is punched, an interlocking device prevents further card insertion until at least one lever is reset. A Time-Data Punch may be used for both attendance and job cost applications. where plant layout permits. It will operate as an individual ac "plugin" unit or as part of an existing IBM time system.

International Business Machines Corp., 590 Madison Ave., New York 22, N. Y.



Motor-Generator

(15

Improvements have been made in the 400 cycle ac motor-generator line. Illustrated is a 15 kw, 400 cycle unit. The input is 25 hp, 220/ 440-volt, 3-phase, 60-cycle, 9-wire, squirrel cage induction motor. Output is 15 kw, 18.75 kva, 80% power factor, 120-240 volt, single phase or 3-phase, 4-wire, 14-pole, 400 cycle revolving field alternator. Unit operates at 3428 rpm. Both the motor and alternator as well as armature of ac field pole exciter is mounted on a common shaft. The 400 cycle m-g set line has been expanded to 250 kva.

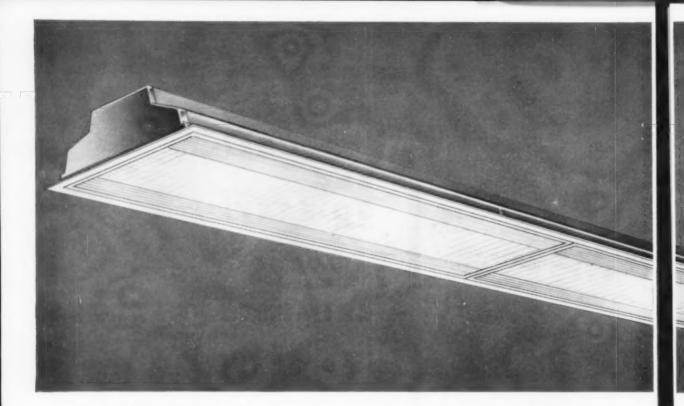
Kato Engineering Co., Mankato, Minn.

Contact Cleaner (16)

Effective on all metals, Cramolin is a contact cleaner which reduces contact resistance by dissolving and removing non-metallic layers of oxide and sulphide. For use on switch contacts, collector rings, brushes, and commutators, the solvent can be used safely at relative humidities of 95% and temperatures up to 100° C.

Caig Laboratories, 46 Stanwood Road, New Hyde Park, L. I., N. Y.





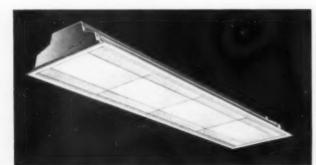
SHALLOW NEW DAY-BRITE TROFFERS

Take a good look at Day-Brite's great new family of shallow troffers for plaster and acoustical ceilings—all available now at new low prices!

Cleartex Plastic enclosed unit, above, is an exclusive Day-Brite design. It's light in weight, combines high light transmission with excellent brightness control.

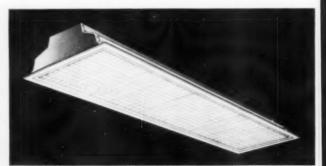
Below, left, is the low-brightness Controlens troffer. New, Waffletex® Plastic troffer is at right, below.

Compatible with a wide variety of ceiling systems, Day-Brite troffers are available in 4-ft., 8-ft., and fill-in sections (choice of two or three lamps). All necessary mounting accessories are included with each unit.



HOLOPHANE CONTROLENS

Low brightness, critical illumination control.



WAFFLETEX® PLASTIC

Light weight . . . light stabilized, exclusive new Day-Brite design.

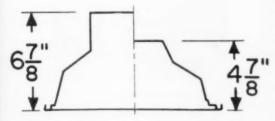
*@Holophane Co., Inc.

NATION'S LARGEST MANUFACTURER OF COMMERCIAL AND INDUSTRIAL



Special features include:

- · Lighter weight; easier installation.
- Enclosures hinged to open from either side.
- Removable wireway covers for easier maintenance.
- Safety fuses to prevent overheating.
- Wired for single-unit or continuous-run installations.
- UNI-FORM construction, one-piece bodies.



SAFER TO INSTALL—Now only 47% inches deep, new Day-Brite troffers shave a full two inches off older designs!

LIGHTING EQUIPMENT



Joseph P. Martien, vice president, and Harry E. Dodds (seated) of Martien Electric Co. check specifications for a new job. One of Cleveland's oldest and best-known electrical contractors, Martien Electric Co. celebrated its 50th anniversary June 8, 1956.

"There's a helpful difference in Day-Brite service, too!"

"In renovating an older building recently, we needed a variety of lighting fixtures. Day-Brite supplied them all . . . on time and properly labeled . . . made our job coordination easy.

"The Day-Brite representative worked with our foreman, going over fixtures, identifying each type, saving us unwrapping and installation time.

"The final Day-Brite touch that made our job profitable was the ease of assembly and installation. Our electricians commented on how few miscellaneous parts were needed to install the fixtures.

"This is the kind of job that has made us partial to Day-Brite equipment and service for many years."

What about you? Isn't it time you let high-quality Day-Brite fixtures bring you consistently higher profits and better-satisfied customers?





Day-Brite Lighting, Inc., 5402 Bulwer Avenue, St. Louis 7, Missouri Day-Brite Lighting, Inc., of Calif., 530 Martin Ave., Santa Clara, Calif.

Electrician saves twice with **Ramset**® fastening tools!

Here is how Harrington Electric Co. used Ramset and Shure-Set® on new Cleveland building



Harrington electricians use powder-actuated Ramser to fasten overhead strip lights, firing anchors into beams wherever needed. No pre-drilling or setting. Fasteners and charges are carried in the pocket of the operator's Ramser apron.



Another Harrington electrician fastens floor conduit with his hammer-in Shure-Set tool. Drives like a nail, holds like an anchor, in concrete subfloor.

Other contractors also using RAMSET products on this 23-story office building: The Feldman Bros. Co.; Korner Sheet Metal Co.; Geo. A. Fuller Co.; Johnson Service Co.; The Gellin Acoustical Co.; Smallwood Plastering Co.; E. J. Brandt Co., Inc.; and Builders Structural Steel Corp.



12105-K BEREA ROAD

CLEVELAND 11, OHIO



Breaker Mechanisms

(17)

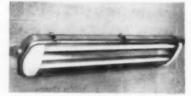
A complete line of extended shaft handle operating mechanisms for all circuit breaker frame sizes E through L, makes it possible to mount breakers in cabinets or enclosures from 5½ in. through 17½ in. deep depending on breaker size and shaft length. Easily installed and adjusted, the mechanism features simple repositioning of its square shaft to permit upright or horizontal breaker mounting and updown or left to right switching motions.

General Electric Co., Plainville, Conn.

Service Entrance Sleeve (18)

A redesigned service entrance sleeve is available in a complete range of sizes in both ½-in, and %-in, diameters. Containing a measured amount of inhibitor, the sleeves have hole depths of variable size and have permanent color coding.

Jasper Blackburn Corporation, 1525 Woodson Road, St. Louis 14, Mo.



Floodlight Luminaires

(19

A new line of 2-lamp fluorescent floodlight luminaires, available in 4- or 6-ft lengths, designed to accommodate either present standard or future higher output lamps. They are for such applications as airport ramp, dock, railroad underpass, tunnel, or substation lighting. Units can be mounted singly, or in "Vee" or "Delta" combinations. Combination latches permit open-

ing cover from either side with opposite latches acting as hinges. Relamping is from either side. Pressure-pad input terminals are tin plated to take copper or aluminum conductors. Other features include spring-loaded lampholders, Neoprene seal between cover and housing, rotating mounting hubs with friction lock, and waterproof entrance bushing.

Line Material Industries, Milwaukee 1, Wis,



Conduit Hanger

(20

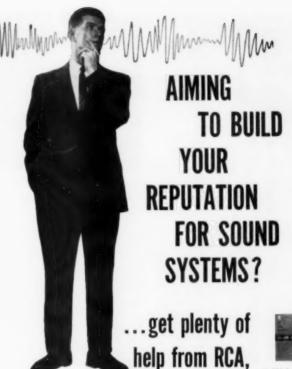
A new Type X right angle conduit pipe hanger provides greater stability with built-in live tension. Type X saddle is made of heavy gauge steel and case hardened by the special Ramodized process combining a hard and corrosion resistant surface with a flexible inner core. Hanger can be used with standard pipe or EMT conduit for mounting on structural flanges up to §-in. thick. Available in §-in. to 2-in. pipe size.

Ramco Manufacturing Co., 540 Westfield Ave., W., Roselle Park, N. J.

Control (21)

The E95, an explosion-proof remote bulb temperature control, is a sensitive, compact unit designed for use in hazardous locations where explosive vapors or gases are present. Composed of two integral assemblies-a remote bulb thermal device and control head with connecting capillary tube of varying lengths-the unit has a cast iron enclosure permitting its use in Class I, Group C and D locations as defined by the N.E.C. Switches are available in any one of three standard types, normally open, normally closed, or double throw with no neutral position; and are rated for 15 amps at 115 or 230 volts ac. All switches are single pole and suitable for 180° F ambient.

United Electric Controls Company, 79 School Street, Watertown 72, Mass.



the leader

Depend on RCA's reputation to do very good things for your own reputation in the soundinstallation business. Right now, there is plenty of volume and profit in this field that RCA could help you wrap up for yourself. The name RCA, long known for sound-engineering quality, is a first choice and always acceptable "or equal" in sound system bids. And before you sit down to figure your next bid, have on hand the set of free RCA Sound brochures shown at the right. Each one is a great idea source and the coupon brings them all, or the ones you want. For practical, job-earned advice, and the best in audio equipment, call your RCA Engineered Sound Distributor. He's easy to reach by phone, listed under "Public Address and Sound Systems" in your classified directory.



1. RCA School Sound System



2. BCA "Arana-Size" Soun



3. RCA Hotel Sound Systems



A RCA Sound in Industry



5. RCA Church Sound Systems



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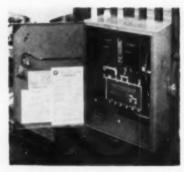
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Comparing Utility Truck Bodies? in every feature that's important to you - value, utility See how READING BODIES top all leading utility bodies conomy! The facts and figures speak for themselves CHART

> * specially adapted for job-planned bodies

Contractors



Autostarter

(22)

A new ac manual non-reversing autostarter, Type JF, is available for starting squirrel-cage induction motors from 5 to 125 hp at 220 volts, and from 5 to 250 hp at 440/ 550 volts. Unit is designed for use wherever across-the-line starting current of motors exceeds local power company restrictions or interferes with plant operations. It is housed in a shallow, wall-mounted NEMA 1 general purpose enclosure but NEMA 4 watertight or NEMA 9 Class 2 Group G enclosures are also available. Overload protection is provided by two MW bimetallic snap-action disc-type overload relays. All starter sizes use doublebreak silver alloy air-break contacts. Modifications available include a time-delay undervoltage protection mechanism, an L-60 electrical interlock for operating external circuits and a cover-mounted ammeter.

Westinghouse Electric Corp., P. O. Box 2099, Pittsburgh 30, Pa.



Solenoid Valve

A new 2-way high pressure solenoid valve is especially suited for hydraulic applications, such as hydraulic lifts and elevators. These heavy duty constructed valves are designed for tight shut-off on pressures to 1500 PSI. They may be mounted in any position without

affecting operation. Bulletin 8223 valve are of the internal pilot op-

erated piston type having angle bodies, available in either stainless steel or brass bar stock with teflon discs and stainless steel magnetic parts. Normally closed operation only. Valves may be supplied for continuous or intermittent service. Available in 1-in, or 1-in, pipe connections and with general purpose, watertight or explosion-proof solenoid enclosures. Brochure on "Bulletin 8223" is available.

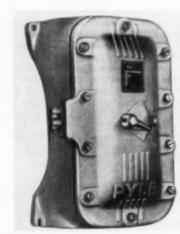
Automatic Switch Company. Florham Park, N. J.

Sealant

(24)

Nuts are quickly sealed to bolts with a new sealant called Loctite. Applied to the joint where nut meets bolt, the sealant hardens in 12 hours to provide a bond that is reportedly unbreakable without the use of tools. Available in a 2-cc squeeze tube.

American Sealants Company, 103 Woodbine St., Hartford 6, Conn.



Enclosures

(23)

(25)

A new line of explosion-proof, dust-tight and weather-resistant circuit breaker Pylets. Designated the ECB Series, enclosures are available for breaker frame sizes from 100-amp, 250 volts ac maximum to 225-amp, 600 volts ac maximum. Of the air-break type, they are suitable for use in Class I, Group D (NEMA type VII); Class II, Groups E, F and G; and Class III (NEMA types IX, V, III) hazardous locations. The rectangular shape of enclosure permits mounting adjacent units on close vertical and horizontal mounting

The Pyle-National Co., 1334 N. Kostner Ave., Chicago 51, Ill.

. . . SEE YOUR LOCAL TRUCK DEALER NOW OR WRITE DIRECT TO READING BODY WORKS, INC., 420 GREGG AVE., READING



There's no need to keep track of <u>these</u> one-way reels...they're non-returnable

Now available in all bldg. wire through 500 MCM, Triplex SD, and line wire

The non-returnable reel—first adopted as a standard by Rome Cable—gets rid of many of your recording, reshipping, and inventory headaches. Here are some of the ways it benefits you:

Eliminates bookkeeping costs. You avoid the extra paper work brought on by billing, crediting, and storing of returnable reels.

Saves storage space. When the wire or cable is used up, you simply destroy the reel or throw it away.

Handles easier. Rome's non-returnable reel is lighter to handle than an ordinary reel—yet sturdy and quite adequate for normal service.

All these benefits are now available to you with all Rome's building wire through 500MCM, Triplex service drop cable, and line wire.

Be sure to consider the advantages of Rome's standard non-returnable reel package when you place your next wire or cable order. Contact your nearest Rome Cable representative for more information—or write to Dept. 139, Rome Cable Corporation, Rome, N. Y.



ROME CABLE

CORPORATION

On ungrounded 440 v. 3-phase systems THIS **ELECTRONIC DEVICE** gives you audio-visual..

... before those hidden grounds become dangerous and costly!

By warning of trouble before it becomes serious, the DELTA-DESCO GROUND ALERT saves in many ways. Saves expensive motor rewinds. Protects switch gear and transformers. Prevents crippling shutdowns. Reduces the possibility of fire hazards and personnel injury.

HOW IT WORKS! RED light flashes on and BELL rings when ground develops in any phase. Only GREEN light burns when phases are ground-free.

Simple, trouble-free. Easy to install. Portable or stationary models.

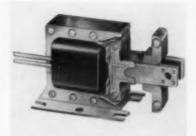
WRITE FOR DESCRIPTIVE BOOKLET -TODAY!

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For any 440 v. 3-phase ungrounded system

DELTA-DESCO Electronic



Solenoid

A coil winding completely encapsulated in Permaseal thermo-setting epoxy is a feature of No. 18 ac solenoid, a unit available for either intermittent or continuous duty operation. Applications include refrigeration, air conditioning, or in other equipment which must perform efficiently under intense moisture conditions. Able to lift up to 11 lbs, the units have a stroke adjustable from is to 1 in.

Guardian Electric Manufacturing Co., 1621 West Walnut St., Chicago 12, Ill.



Fluorescent Floodlights

New Steber Series TFL fluorescent area floodlights are designed for maximum utilization of high output rapid-start, power-groove, and VHO lamps. Each unit accommodates two 48-in. fluorescent tubes which are provided with individual, deep parabolic snap-out inner reflectors. Of all aluminum streamlined design, Series TFL units can be furnished with or without plexiglas extruded doors and with or without tubes. Single and dual mounting arms are also avail-

Steber Manufacturing Broadview, Ill.

Disconnect

A new tool operated disconnect is made for use with Loadbuster, the portable loadbreak tool. Rated at 15 kv, 400 amps, it has an im-

pulse-withstand rating of 95 kv, or 110 kv for heavier types, and a momentary short time current rating of 20,000 amps. It provides low cost load switching anywhere on the distribution system. Some of the features are: heavy duty channel base; large bearing surface: four-bolt mounting: deadending provision; two-stud insulator; disconnect gap; silver-tosilver contacts; and dual-purpose connectors take aluminum or cop-

S & C Electric Co., 4435 Ravenswood Ave., Chicago 40, Ill.

Panelboard

(29)

A 3-pole, solid neutral panelboard with 125-amp main lugs has six "Renu-Fuse" pull cover circuits and 12 plug fuse circuits. One 60-amp "Renu-Fuse" unit controls the 12 plug fuse circuits and sub-feed terminals while the other 60-amp pullout controls a range circuit. Remaining four units are rated at 30 amps and can be used for water heater, dryer, air conditioning, and other uses. Line side lugs, including neutral, are designed to take aluminum or copper wire; cabinet is available in both flush and surface type door trim. Unit carries U.L. approval.

The Wadsworth Electric Mfg. Co., Inc., Covington, Kentucky.



Junction Box

A new, explosion-proof, raintight junction box designed especially for service station islands. The box is listed by UL for Class I, Group D and Class II, Groups F and G. Walls are heavy enough to drill and tap anywhere in the sides for conduit through 2 in, and ample room for wiring. Box is made of Adalloy, a non-rusting and nonsparking cast aluminum alloy. It has a screw-on cover with built-in cover seal and fits flush with top of service station island.

Adalet Manufacturing Co., 14300 Lorain Ave., Cleveland 11, Ohio.



Rome's new service entrance cable is designed for modern 100 ampere service



Rome's new and improved Type SE service entrance cable meets all requirements for 100 ampere service that can handle all the electric appliances and air conditioning needs of modern living.

In addition, it may enable you to reduce warehouse inventory levels and the amount of cable carried in your service trucks. You can use the same cable: 1. From pole to meter. 2. From service drop to meter. 3. And from meter to electric range, clothes drier, hot water heater.

Other features include:

- The outer glass-cotton braid is finished to give the cable a neat appearance without sacrificing flame and moisture resistance.
- 2. The glass-cotton braid on each con-

ductor—one red and one black—provides easy conductor identification.

- Underwriters' approved for 75° C, operation in either dry or wet locations. A reinforced rubborized tape under the weather-resistant outer braid puts the conductors in a "dry location."
- 4. In three conductor construction for 100 ampere service, Underwriters' approval makes possible the use of size 3 AWG copper conductors, or two 3 AWG conductors with a 5 AWG neutral conductor.

Specify Rome service entrance cable for your next job. Contact your nearest Rome Cable representative for more information—or write to Department 365-B and ask for Bulletin SE-1. Rome Cable Corporation, Rome, New York.

ROME CABLE

CORPORATION

I-T-E... Pioneer in

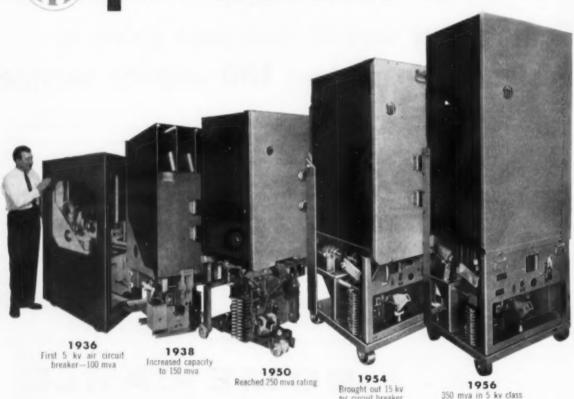
In 1936, I-T-E introduced the first 5 kv magnetic air circuit breaker and it has led the field in development of this type of equipment ever since. In the past 4 years alone, it has extended its line of 5 kv metal-clad switchgear to include the first 350 mva interrupting capacity air breaker and its line of .5 kv metal-clad switchgear to include the first 1000 mva air breaker.

Get complete information on all I-T-E high voltage magnetic air circuit breakers. Call our nearest sales office today for it. Or write Switchgear Division, I-T-E Circuit Breaker Company, 19th & Hamilton Sts., Philadelphia 30, Pa.



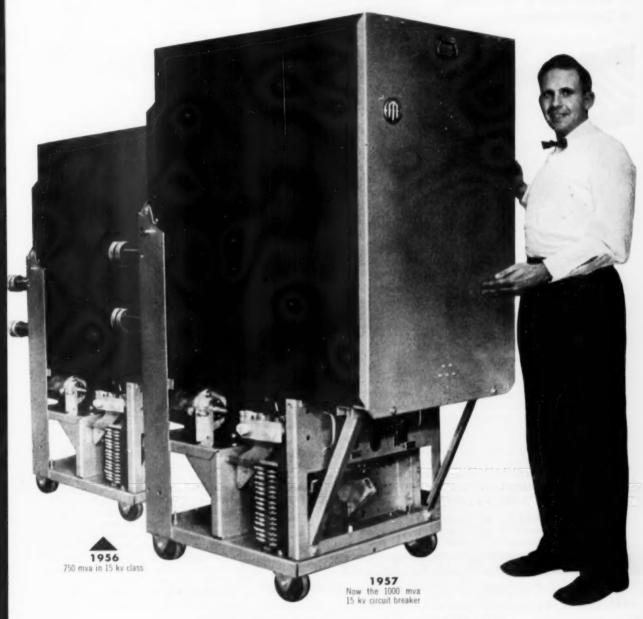
SWITCHGEAR DIVISION

CIRCUIT BREAKER COMPANY



air circuit breaker

Air Circuit Breakers



ELECTRICAL CONSTRUCTION AND MAINTENANCE . . . NOVEMBER, 1957

NOW...GLOBE OFFERS... two new INTERCHANGEABLE trays for support of cables, wiring and tubing



cation wire, instrument tubing and control cables in automation applications.

These two cable trays have been thoroughly field tested in hundreds of large industrial installations, in new plant construction, in power plants, in modernization, and for power distribution in all types of manufacturing processes. A new catalog, just off the press, gives full information and installation techniques. Ask for your FREE copy today.

Distributors are to be found in all principal cities consult the yellow pages in your phone book under "Gratings" or "Conduits" for the one nearest you.

PRODUCTS DIVISION

is intended for the support of communi-

The GLOBE Company MANUFACTURERS SINCE 1914
4032 SOUTH PRINCETON AVENUE, CHICAGO 9, ILLINOIS



Lamp and Fuse Holder

(31)

Designed primarily for the stove industry as an oven light socket and fuse holder, these snap-in porcelain lamp and fuse holders feature easy installation provided by a tempered spring steel clip which accommodates materials in thicknesses from 0.025 to 0.095 in. The clip compresses as it is forced into the hole in the mounting plate and then expands holding the piece securely in place. Available with either screw terminals or male tabs which fit AMP and other types of female quick connect terminals, these units can also be furnished with leads.

Circle F Manufacturing Co., Trenton 4, N. J.



Lighting Fixture

(32

An all-extruded aluminum area light with GE power groove lamps, has been added to this fluorescent fixture line. Specially designed for use in areas where high intensity light control is required, it is streamlined for minimum wind resistance at high mountings. One piece aluminum extrusion forms a box girder with open bottom. Continuous hinge in channel for door mounting. Doors of clear glass or ribbed glass mounted in removable extruded aluminum frame. Fixtures come complete with curved aluminum hanging bracket. Single 2-in. slipfitter in top-center for mounting. Available in 4- and 6-ft

Magni Flood Inc., 38 North Second Ave., Mount Vernon, N. Y.

A new line of decorative lamps, called "Lighted Ice," features six new colors-emerald, garnet, pearl, ruby, topaz and turquoise. The lamps are round and approximately 2 in. in diameter. They are covered with bagette-shaped crystals which diffuse and transmit light in all directions. They are multiple burning lamps (when one burns out the others stay lighted) designed for use on 120-volt household circuits. Their candelabra screw bases will fit into regular C71 Christmas lamp or other candelabra screw base sockets. They may be used outdoors when installed in proper equipment.

General Electric Co., Nela Park, Cleveland 12, Ohio



Welding Gun

(34)

A new small stud welding gun, called the Nelson NS-10, will weld all studs up through \(\frac{1}{2}\)-in. in diameter. The gun weighs less than 4 lbs and measures 9 in. long. The NS-10 uses the regular Nelson line of studs, ferrules and welding accessories.

Nelson Stud Welding Division, Gregory Industries, Inc., Lorain, Ohio

Terminal (35)

A new "Speedwire" terminal is built on the Series 600 ac Quiet Switch line. The new terminal permits the insertion of two No. 12 or two No. 14 wires which makes possible "looping" of the hot wire to another switch. Side release slot allows easy removal of wire. 600 Series includes single pole, double pole, 3-way, and 4-way switches both in brown and in ivory.

Slater Electric & Mfg. Co., Inc., Glen Cove, New York.



Have you changed your electrical system over to winter?

Let's reduce motor burnouts this year. Remember to change your motor protectors back to winter ratings.

During the hot summer months, many maintenance departments are forced to up-rate the elements in motor protectors to prevent nuisance stoppages due to high temperatures. When winter comes, they neglect to change back to normal ratings. That's when many motor burnouts occur.

ELIMINATE THE WHOLE PROBLEM

You can lick the whole problem, and eliminate motor burnouts too . . . just by using Heinemann Motor Controllers. The rating of Heinemann Motor Controllers is unaffected by heat or cold. No unnecessary stoppages in summer; no change-overs for winter.

The difference is that Heinemann Motor Controllers operate on power, not heat. Instead of thermal elements, they employ a hydraulic-magnetic principle that you should know about.

Send for a copy of Manual 101, "What you should know about Circuit Breakers" and Bulletin 1410 on Heinemann Motor Controllers. Heinemann Electric Co., 132 Plum St., Trenton 2, N. J.

HEINEMANN

Motor Controllers

When Your Plans Call For FITTING CH BOX

Specify



"Like money in the bank"-That's what estimators think about Arrolet's dependability when figuring job costs. Arrolet products have all the features you need to help keep installation time and costs under tight control. Here's a good example:



ARROLET **Bevel Corner**

SWITCH

cat. no. 140-HGBR

Non-Gangable

Outstanding features of this box are the self-gauging notches for quick, accurate alignment with ½" and ½" walls. Only 2 nails needed to hold it securely in place.

Has 2 cable K.O.'s in each end and one ½" K.O. in bottom. 2 CRS non-metallic cable clamps. Projection welding gives BR bracket maximum strength.

Complete details about various mounting devices for the 160-NG series given in our New Product Sheet No. 2c.

For boxes, fittings and accessories that do the job best, make sure to specify 'ARROLET' in your next order.



WALL CHART - Box guide for maximum number of conduc-tors. Quickly identi-fies boxes & covers.

Ask for Latest Catalog, Too. Write for Both, Yeday!

ARROLET CORPORATION MONTGOMERY, PENNA

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(36)

(37)

Heater

Rated at 1500 watts, 5120 Btu, 240-volt, and measuring approximately 381 in. long by 121 in. high, this electric glass heater, model HW-15, blends with any room decor and provides even diffusion of its heat output. Heart of the unit is a Pyrex glass heating element which does not glow. A line voltage thermostat section which may be easily mounted on either end of the heater is available as a separate accessory and can control up to three HW-15

Berko Electric Mfg. Corp., 212-40 Jamaica Ave., Queens Village, N. Y

Fluorescent Lamp

A new fluorescent lamp reportedly produces two and a half times as much light as standard fluorescent lamps. Termed the "Super-Hi" lamp, the new unit has new design principles which permit extremely high energy loading of electrodes, arc stream, and phosphorescent coating. Available in 48-, 72-, and 96-in. sizes, the new lamps are rated at 6000, 9300, and 13000 initial lumens respectively. They will be available initially in cool white and will be produced with recessed double contact bases.

Westinghouse Electric Corporation, Bloomfield, N. J.

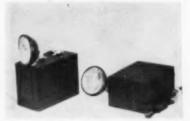


Explosion-proof Switch

A new series of explosion-proof switches that feature double conduit openings. Designed the "EX1" series, they carry full UL listings for hazardous atmospheres of Class

1, Group C and Group D; Class 11, Group E, Group F and Group G. All switches have adjustable rollerarm, actuators with non-sparking rollers. Aluminum alloy housing of series has ample room for wiring through both conduit openings which can be supplied for use with either 1 in. or 1 in. diameter conduit. Two 10-32 NF tapped mounting holes on top, side and bottom of switch housing permit direct mounting and wiring. Variations available in the series are: singlepole single-throw and double-pole double-throw contact arrangements. different-size conduit openings, and a wide range of electrical ratings.

Micro Switch, a division of Minneapolis-Honeywell Regulator Co., Freeport, Ill.



(39)

(40)

Standby Lights

Two new standby and emergency lights are designated Model DA and Model D respectively. Model DA uses an 800 candlepower floodlight and furnishes three hours of continuous light or four hours of intermittent light. Ordinarily plugged into the ac lines, the unit will automatically operate when usual ac power fails. Model D is a portable lamp without standby features but with shoulder strap and 40,000 candlepower spot. 800 cp flood and 40,000 cp spot are interchangeable on both models.

Clean Sweep Co., 65341 Whittier Blvd., Los Angeles 22, Calif.

Current Limiting Fuse

Current limiting fuses, CLF, are now available with slotted tangs. This universal mounting facility-applicable to the 809-4,000amp portion of the complete CLF line-enables the standard fuse to accommodate equipments having either the proposed NEMA standard drilling or the so-called "Pringle" drilling. A single standard model will accommodate both drill-

General Electric Co., Schenectady 5, N. Y.

BY MOE LIGHT * Inspiration-Lighting for Commercial Applications

adds incomparable distinction to any commercial interior

The imaginative use of decorative lighting is of ever increasing importance to today's hotels, motels, stores, offices and institu-tions. And, Moe Light's exciting new catalog of IL* fixtures for commercial installations, together with their policy of realistic prices for high-styled fixtures, add up to a big new profit opportunity for the contractor who goes after this huge market. For the first time, you can order all your fixtures-residential and commercial-from the leaders of the industry: Moe Light!

dramatic lighting helps set your "theme"

Famous Cordette Casuals by Moe Light can create many moods—in this interior, they add a gracious look to the dining area, while lending an air of informality to the bar.

(Fixtures shown: M-1427 3-Lite cluster in main dining area; M-1437 "3-in-line" accents the wall; M-1421 cones over bar.)

REE! A manual of creative lighting for the discriminating professional

> MOE LIGHT'S NEW IL* COMMERCIAL CATALOG



Dozens of interior sketches; plus Moe Light's commercial IL® fixtures. Free to members of the profession ONLY. Write to:

THOMAS INDUSTRIES INC. MOE LIGHT DIVISION, Dept. ECM-11

410 So. Third St., Louisville 2, Ky.

Leaders in Creative Lighting

BOSS JOB-ENGINEERED ELECTRICAL BOXES AND WIREWAY



- Build and maintain Customer Satisfaction
- Increase Sales and Profits



Job-engineered for quick, easy installation, BOSS boxes are code gauge steel, smooth corners, with firm but easy knockouts. Finished in durable gray baked enamel. Complete line, from 4½" x 5" x 3" to as large as needed. Surface or flush mount, with hinged or screw-on covers.





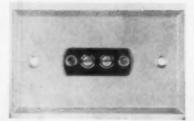
BOSS Wireway and Fittings are easily adapted for "close fit" jobs where space is at a premium. Available in a wide range of sizes. Flangeless wireway is equipped with screw shelds to protect wire as it is drawn through. Elbows, tees, closing plates. Telescoping fittings, nipples.

fittings, nipples, hangers . . . these and other fittings are available in flanged wireway. Better Buy BOSS . . . your all-in-one source for quality electrical boxes and

source for quality electrical boxes and wireway. Sold through distributors only. Write for catalog and complete information on the entire line.

THE HUENEFELD CO.

CINCINNATI 25, OHIO, U.S.A.



TV Outlet (4)

Tarnish-proof TV outlets in a number of popular finishes are now available. Featuring an insulated, two-screw terminal (front and rear) securely mounted on the wall plate, the outlet requires no special socket, receptacle or tool. Outlet is available in .040 brass, brass alloy, stainless steel, chrome steel, ivory or white enamel vacuum-metallized finishes to complement any decor.

Perfect-Line Manufacturing Co., Old Country Road and RR Avenue, Hicksville, L. I., N. Y.

Tape (42)

A new line of "Teflon" skived tape for wire and cable wrapped insulation is available in widths of &, 1, 1, 1, 1, and 1 in. and in thicknesses from 0.002 in. up. Packaging is in 7- to 8-in. rolls, on cores of either 14-, 2-, or 3-in. I.D. Included in "Teflon's" properties are: a dielectric strength of 1000 to 2000 volts per mil; dielectric constant of 2.0 through the entire frequency range; power factor of less then 0.0003 through the entire frequency range; zero moisture absorption; tensile strength of over 2000 psi; and stability over a temperature range of -400°F through 500°F.

Dixon Corporation, Bristol, R. I.



Ground Outlet

Line-to-ground faults in 440-volt, 3-phase ungrounded electrical systems are quickly detected, and both visual and auditory warning given by this new electronic ground alert. Available in either a portable or permanently fixed version, the instrument gives immediate and positive indication of a fault well before insulation resistance drops to zero ohms. Unit can be present to indicate any minimum resistance to ground from 7500 to zero ohms. Other alert systems are available for 220-volt, 3-phase ungrounded systems, 2,300-volt, and 4,160-volt systems.

Delta Engineering Sales Co., Box 1403-W, Shreveport, La.

Spot and Flood Lamps (44)

A new line of Colortone spot and flood lamps with broad application in residential, commercial, store window, garden, theatrical, nightclub, roadstand, restaurant, monument, and display fountain lighting. The new group of brilliant red, blue, green and yellow 150-watt, 115-125volt PAR-38 Colortone lamps incorporates specially designed, nonfading, built-in transparent colored lenses. Constructed of weather resistant glass, the lamps are further protected with an exclusive transparent silicone-coated lens which makes them resistant to breakage, fading or peeling on contact with snow or rain. The rated life is 2,000 hour.

Westinghouse Electric Corp., Bloomfield, N. J.



Fish Tape

(43)

Made of spring steel, Cope fish tapes are available in a range of sizes and weights for light, standard, and heavy duty conduit work. Seven sizes are included; the smallest for light duty measures \(\frac{1}{4}\) in. by \(\frac{1}{4}\) in. and weighs 11 lbs per 100 ft.; the largest tape is 1 in. by \(\frac{1}{4}\) in. at 49 lbs per 100 ft. Mounted on a steel frame, the tapes come fitted with a ball roller end and a hand grip for both pushing and pulling.

T. J. Cope Division of Rome Cable Corporation, Collegeville, Pa.

YOUNGSTOWN BUCKEYE CONDUIT



HOT GALVANIZED:

High quality steel pipe is first, thoroughly cleaned by pickling in acid, then immersed in a beth of molten pure zinc. After threeding, a coeting of tough, transparent enamel is baked on protection of zinc and enamel—inside and out.



BLACK ENAMELED:

A protection, black enamel coating is applied inside and out by dipping. When a uniform thickness of this coating has been achieved, it is then baked to form a tight, elastic, high lustre finish—guarding against cracking in bending or forming operations during installation.



ELECTRO GALVANIZED:

After being threaded, reamed and carefully inspected, this

conduit is cleaned by pickling.

then uniformly coated outside

with zinc. A cost of tough,

elastic black enamel is then baked on the interior, provid-

ing protection as well as a

ELECTRICAL METALLIC

TUBING: Absolute uniformity of weight, wall thickness and concentricity, plus protective outside coating of pure zinc and baked-on elastic enamel interior, forms this modern mirrorsmooth raceway. Lightweight, easy to handle, no threads to cut, bends readily and assures safe, economical, life-time electrical installations.

Yes, Youngstown Buckeye Conduit has been proven through the years by thousands of owners and by leading Electrical Contractors the world over . . . proven that it is easy to bend . . . easy to fish wires through . . . and economical due to greater corrosion resistance that means longer, trouble-free life in actual service. Youngstown Buckeye Conduit has also proven that it pays dividends through lower installation costs and greater efficiency. Add to these many features the fact that Youngstown Buckeye Conduit is manufactured "from iron ore to the finished product" by ONE integrated steel company and you know why it is preferred by so many.

ProveN - THE YEARS

Size		Nominal Diameter (Inches) Internal External		Nominal Wall Thickness (Inches)	Threads Per Inch	Feet Per Bundle	
	8/2	.622	.840	.109	14	100	
	3/4	.824	1.050	.113	14	50	
	1	1.049	1.315	.133	111/6	50	
	11/4	1.380	1.660	.140	1136	30	
	1 1/4	1.610	1.900	.145	1116	30	
	2	2.067	2.375	.154	111/2		
	21/4	2.469	2.875	.203	8		
	3	3.068	3.500	.216	8		
	314	3.548	4.000	.226	8		
	4	4.026	4.500	.237	8		
	5	5.047	5.563	.258	8		
	6	6.065	6.625	.280	8		

Conduit furnished in 10-foot lengths, threaded both ends with one coupling.

COUPLINGS

Size	Outside Diameter (Inches)	Length (Inches)	Pieces Per Carton
1/2	1.063	1.562	100
3/4	1.313	1.625	50
1	1.576	2.000	50
11/4	1.900	2.062	50
1 1/2	2.200	2.062	50
2	2.750	2.125	25
21/2	3.250	3.125	
3	4.000	3.250	
31/2	4.625	3.375	
	5.000	3.500	
5	6.296	3.750	
6	7.390	4.000	

ELBOWS

Size	Radius (Inches)	Offset (Inches)	Pieces Per Carton
1/2	4.000	6.500	50
3/4	4.500	7.250	50
1	5.750	8.750	25
1 1/4	7.250	10.500	20
1 1/2	8.250	11.750	15
2	9.500	13.500	10
21/2	10.500	15.000	
3	13.000	18.000	
2 1/2 3 3 1/2 4 5	15.000	20.500	
4	16.000	22,000	
5	24.000	31.000	
6	30.000	37.500	

ELECTRICAL METALLIC TUBING

	Nominal Diameter (Inches)		Nominal Wall Thickness		Fret
Size	Internal	External	(Inches)	Per	Bundle
1/2	.622	.706	.042		100
1/3 3/4	.824	.922	.049		100
1	1.049	1.163	.057		100
1 1/4	1.380	1.510	.065		50
1 1/2	1.610	1.740	.065		50
2	2.067	2.197	.065		30

EMT furnished in 10-foot lengths, without couplings.





Whatever the job..



you need Westinghouse Load-O-Matic . . . the modern precision crane control

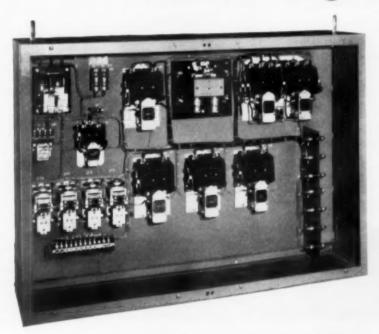
You may never need to handle anything as delicate as this atomic reactor, but the one really up-to-date means of controlling your a-c crane for any duty is the Westinghouse LOAD-O-MATIC® control.

LOAD-O-MATIC utilizes static reversing, thus doing away with troublesome reversing contactors. The stepless feature of LOAD-O-MATIC, effective down to and including zero speed, eliminates the necessity for old-fashioned "inching" or "jogging" and permits infinite speed control in spotting loads. These features also cut mainte-

nance costs by as much as 60 percent over conventional crane control.

The LOAD-O-MATIC system utilizes the drive motors for electric braking, greatly increasing the life of mechanical holding brakes and cutting crane operating costs. Precision, economical LOAD-O-MATIC can be utilized on any crane . . . at only slightly higher cost than old-fashioned crane control. For complete information, see your Westinghouse sales engineer. Or write Westinghouse Electric Corporation, P.O. Box 868, 3 Gateway Center, Pittsburgh 30, Pa. J-22072

YOU CAN BE SURE ... IF IT'S Westinghouse



CONTROL PANEL OF LOAD-O-MATIC is easily accessible, with front wiring throughout. Devices included are rugged, industrytested Westinghouse units.

Get WALKER POWER CONVERSION Low Cost Trouble Free Dependable



Walker rectifiers are designed to meet your exacting AC to DC power conversion needs. You get years of completely trouble-free service. No moving parts to wear out — nothing to get out of adjustment.

With Walker rectifiers — silicon, germanium or selenium — you get maximum service at minimum cost. Power factor of 97%, DC ripple of approximately 4%.

Whatever your AC to DC power conversion needs, there's a Walker Rectifier that's exactly right.

Get complete details now — just write, wire or phone The Walker Division, Norma-Hoffmann Bearings Corporation, Stamford, Connecticut. Telephone: Fireside 8-2641. Silicon
Germanium
Selenium
Rectifier
Power
Supplies



Brackets

(46)

A new line of galvanized steel street lighting brackets for fluorescent luminaires. Designed to provide improved horizontal deflection characteristics, the new brackets, with mounted luminaires having up to 8 sq ft of projected area, will withstand wind velocities up to 100 miles per hour. Made of 2-in. pipe, the brackets are reinforced to dampen vibration. The upsweep bracket is available in nominal 3-ft and 4-ft sizes. An adaptation of this is available in 4-ft. 6-ft and 8-ft sizes. Mast arm bracket is available in 10-, 12-, 14-, 16-, 18and 20-ft sizes.

Hubbard and Company, 6301 Butler St., Pittsburgh 1, Pa.

Receptacles

(47)

Special terminals have been introduced in this line of bakelite ceiling pull receptacles. On the new assembly the binding screw heads face up. They have larger heads, and are staked and backed out ready for wiring. The terminal is of heavy steel. They are listed by UL and are available in 31 in. and 4-in. diameter; in mottled brown or white bakelite. Both are two-piece designed, with medium base and groove shadeholder equipped with pull cord or 5-in. pull chain and bell.

Eagle Elec. Mfg. Co., Inc., 23-10 Bridge Plaza So., Long Island City 1, N. Y.

Calculator

(48)

The electrical heat-load calculator gives 100% accurate readings of heat loss in watts, making it possible to select proper heating unit required for a given space instantly. Covers "U" factors from .06 to 1.13. On reverse side is a complete condensed list of the more commonly



used factors. Based on 70° temperature differences, slides for other temperature differences are available. A companion tool, known as the Area and Volume Calculator, which determines area of walls, ceilings, floors and glass areas in square feet, is also available.

Paul S. Morton Engineering Service, 5131 Meadowlark Lane,





Generator Control

(49)

A newly designed, floor mounted diesel generator control cabinet for generators of 35 to 250 kw. 480 volts, can be used with both single unit standby installations and multiple generator parallel service. Instrumentation includes a 4-in. fullview voltmeter and ac ammeter with switch, 50 or 60 cps vibrating reed frequency meter, field rheostat, and voltage regulator switch. Hinged pan-type instrument panel is offered as optional equipment. Also available are kilowatt meter. governor control switch, synchronizing lights and sync switch with removable handle, cross-current compensation, field discharge switch and resistor, convenience outlets. and combination frequency and elapsed time meter.

Lake Shore Electric Corporation, 202 Willis St., Bedford, Ohio,

Photoelectric System (50)

A new long range photoelectric control system uses invisible modulated infrared light to protect large areas against intrusion. The system consists of a modulated infrared source, a photoelectric receiver and a control unit. The high sensitivity of the system permits coverage up to 1000 ft using a single system. By combining systems, critical areas in factories, stores, warehouses, and military installations

LOCATING FAULTS ON POWER CABLES

... under conditions which retard efforts by tracer methods



With submarine and buried cable, difficulty is often encountered in localizing and locating faults. Likewise in duct line construction, water-filled manholes, ice, snow and traffic can be serious deterrents in the use of tracer methods of fault location.

Biddle High Voltage Bridge

An unique instrument for locating faults on power cables.

Extremely compact, and designed for utmost safety and convenience. It embodies some features not found in any other Murray Loop type bridge.

Designed for Safe, Convenient Operation

Every detail of design has been conceived in the interest of maximum safety and convenience for the operator. The galvanometer and counter are observed through a clear plastic window in the top of the metal case. A special protective circuit prevents damage to the galvanometer in the event the fault resistance flashes over when a measurement is being made.

Unusually Fine Adjustment and Sensitivity

A high speed Veeder counter, geared to the moving contact assembly, indicates 10,000 divisions of the slide wire. The galvanometer is specially designed for ruggedness and sensitivity.

For Use With Biddle Cable Fault Locator Transmitters

The Biddle High Voltage Bridge was designed for use up to 25 kv to ground. The Model 3, 25 kv, Transmitter can be used as a power supply up to its maximum voltage. Likewise the Model 4, 15 kv, and Model 5, 5 kv, can be used up to their maximum voltage in the same manner as any ordinary d-c supply for Murray Loop bridges.

A Wide Range of Biddle Cable Fault Locating Equipment

We offer three models of our Impulse Cable Fault Locating Transmitters and D-C Proof Testers. Model 3 Transmitter, 25 kv, 1.65 muf, Model 4, 15 kv, 2.00 muf, and Model 5, 5 kv, 16.00 muf. If you have problems in locating faults in electric power cable, please write us.

Write for Bulletin ECM

8-714

JAMES G. BIDDLE CO.

ELECTRICAL TESTING INSTRUMENTS
 SPEED MEASURING INSTRUMENTS
 LABORATORY & SCIENTIFIC EQUIPMENT

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GENUINE JOE SAYS:

MOTOR REPAIRMEN:

Use Genuine Wagner Motor Repair Parts for Fast, Economical repair jobs



If it's a Wagner Repulsion-Start Induction Motor . . .



If it's a Wagner Capacitor-Start Induction Motor . . .



BEARINGS

Wagner babbitt-lined sleeve bearings are diamond-bored to exact size—duplicates of the original bearings. Ball bearings-exactly the same as the original.



Steel-backed, babbitt-lined bearings have high load carrying capacity—won't seize - resist corrosion. They're easy to install with







The right size and grade for best motor performance.



CAPACITORS

The capacitor number, stamped on the motor nameplate, is an easy guide to the right selec-



BRUSH HOLDERS

Complete with brushes. Other parts of short-circulting and brush lifting mechanism are also available.



Wagner quick-break switches are exceptionally efficient and troublefree. But, if you do need a replacement, these are just like the original witches.



COMMUTATORS

Built with extra strength for longer service life.



SWITCH HUBS

Precision built to be exact duplicates of the originals.



ROTOR ASSEMBLIES

Save rewinding costsrotors are completely assembled, ready to install.

GOVERNOR WEIGHTS AND SPRINGS

Designed to assure operation at the correct speed.



For fast, economical repairs—team up your know-how with these genuine Wagner Motor Repair Parts-available through more than 950 Wagner Authorized Service Stations or Parts Distributors.



WAGNER ELECTRIC CORPORATION 6413 Plymouth Ave., St. Louis 14, Mo., U. S. A.

MOTORS - BEARINGS - STANDARD ROTORS BRUSHES . CAPACITORS . COMMUTATORS

OVER 950 AUTHORIZED SERVICE STATIONS OR PARTS DISTRIBUTORS

can be surrounded or criss-crossed with unseen "curtains" of invisible light. The instant an intruder enters the protected area the control sounds an alarm or flashes a warning to protection personnel. System may be installed either indoors or out, and is supplied with weatherproof shield for infrared source and receiver for outdoor application. Bulletin PA 579 is available.

Photoswitch Div., Electronics Corporation of America, 77 Broadway, Cambridge, Mass.



Flasher Lights

(51)

2-way flasher lights are suited for use as warning signals on road, street, construction projects, and other hazardous places. Tamperproof, moisture and weather resistant, these units will operate at extreme temperatures and can be safely used near explosive vapors.

Gen-A-Matic Corporation, 14741 Bessemer St., Van Nuys, Calif.

Wall Switch

(52)

Model 600 quiet wall switch is the screwless, postless type of switch, and wires are inserted through case holes which house spring-loaded clamps. It is designed to accommodate two wires in each of the holes so that running wires to another switch becomes simple.

Slater Electric & Mfg. Co., Glen Cove. N. Y.

Load Control

(53)

The PLC-4 peak load control will automatically reduce the voltage of circuits it controls from 240 to 120 volts, thus bringing about a 75% reduction in power drawn, a drop sufficient to alleviate consumption during peak load periods. Unit is a

4-circuit control with each circuit rated at 20 amps, 240 volts ac, giving a total capacity of 19,200 watts. Installation is accomplished by wiring into the circuit, the peak load control and a single throw, time switch, not included with the unit, between the regular fuse panel or circuit breaker and heater load.

Berko Electric Mfg. Corp., 212-40 Jamaica Ave., Queens Village, N. Y.

Product Briefs

(54) Development of saw blades for cutting stainless steel has been iointly announced by Price & Rutzebeck and the H. & T. Keesling Corp., Hayward, Calif. . . (55) A high current density, industrial type selenium rectifier especially suited for cathodic protection equipment used on pipelines has been developed by Radio Receptor Co., Brooklyn, N. Y. . (56) A worksaver rider-walkie lift truck with an attachment to integrate the unit with conveyor lines carrying bulky, fragile materials, has been announced by Yale & Towne Manufacturing Co., Philadelphia, Pa.

(57) Pyramid Instrument Corp., Lynbrook, N. Y., has introduced a Remcon Closet-Lite, which follows the same principle as all the Remcon low-voltage switches. . . . (58) Availability of Teflon electrical tubing in the complete range of sizes from AWG No. 30 through AWG No. 0 has been announced by Dixon Corp., Bristol, R. I.

(59) Fastway Fasteners, Inc., Lorain, Ohio, has announced a new Fastway Ham-R-Tool, together with 11 sizes of stud pins for use in the new tool. . . . (60) A new low cost, high utility Ditch-Witch, service line trencher, Model M, has been developed by the Charles Machine Works, Inc., Perry, Okla. . . . (61) A new stud driving tool, powered by a 22 caliber blank cartridge, has been announced by Remington Arms Company, Inc., Bridgeport, Conn.

(62) A complete line of bituminized fiber conduit produced in 10-ft lengths is now being offered by Kyova Fiber Pipe Co., Ironton, Ohio. Sizes are made in 2-, 3-, 3\(\frac{1}{2}\), 4-, 4\(\frac{1}{2}\), 5- and 6-in. diameters. . . . (63) An all purpose hammering tool, attaches to any type and make of \(\frac{1}{2}\)- or \(\frac{1}{2}\)-in. electric drill, or flexible shaft from any power source, has been developed by Hamer-Dril Company, New York, N. Y.



LEVITON specification grade Switches and Receptacles

for industrial, commercial and residential use

Compare Leviton even under the most extreme conditions. Leviton wiring devices give you the utmost in performance at minimum cost . . . with absolutely no compromise in quality.

COMPARE THESE SPECIFICATION GRADE SERIES

"5000" Line Lev-o-lock

Quickwire

U-grounding Devices Interchangeable Devices

Lev-o-Let

Weatherproof Devices

CHECK THESE FEATURES FOR YOURSELF

- · Molded of heavily sectioned rugged bakelite.
- Heavy gauge, rust-proofed underslung strap solidly riveted to cover and base.
- · Wide break-off plaster ears.
- Large head No. 8 terminal screws staked and backed out to accommodate No. 10 conductors.
- Individually packed with mounting screws attached to strap.
- Switch mechanisms utilize a high grade bronze for wide, double wiping contacts.
- · Solidly riveted assembly prevents any loosening.
- · Receptacles have double-wiping phosphor bronze contacts.
- · Meet UL, C.S.A. and Federal Specifications.



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For building wire and cable contact our subsidiary: AMERICAN INSULATED WIRE CORP.

Giant Strength



CM PULLER

- SMALL Lever is only 20%" long.
- POWERFUL 83 lbs. on lever* produces 3,000 lbs. at hooks. *1½ ton model.
- VERSATILE "CM-Allay" flexible welded chain, Lifts or pulls at any angle
- PORTABLE Made of aluminum allay. % ton model





FOR CONSTRUCTION AND MAINTENANCE

The "CM" Puller will do a "thousand-and-one" jobs for you. It will do them faster, safer and for easier. The "puller" is compact...stores conveniently in a tool box. Lifetime lubricated.



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REGIONAL OFFICES, NEW YORK, CHICAGO, CLEVELAND

Gives a Man Catalogs, Bulletins and **Engineering Data**

- (64) LIGHTING FIXTURES. Sales folder suitable for mailing describes ceiling mount, pull down and decorative units for commercial and residential applications. EJS Lighting Corp.
- (65) PHOTOELECTRIC CONTROLS for protection of property against intrusion using invisible infrared light beam. 2-page bulletin PA 579 gives complete specifications, photos and dimensions. Photoswitch Div., Electronics Corp. of America,
- (66) POWER SYSTEMS. 8-page folder F-111 describes and illustrates three types of packaged systems for charging radio batteries of trucks and other mobile equipment. D. W. Onan & Sons Inc.
- (67) WELDING ACCESSORIES. New catalog pages describe a ball-point cable splicer which allows the user to splice welding cable in two minutes, and a whip cable plug which provides a quick method for attaching whip cables to welding lead cables. Tweco Products, Inc.
- (68) BRAKES & CLUTCHES. Catalog Digest WEB 6292 gives easy-toread facts about electric brakes. clutches and controls for miniature mechanisms or high torque machine drives. Warner Electric Brake & Clutch Co.
- (69) ADJUSTABLE LIGHTS. Folding mailing piece describes line of wall brackets, ceiling fixtures and Trol-E-Duct units with photos and cartoons. Swivelier Co. Inc.
- (70) LUMINOUS CEILINGS. New 8-page brochure illustrates and describes seven different types of luminous ceilings plus specially designed track systems. Luminous Ceilings Inc.
- (71) FASTENING DEVICES including plastic screw anchor kits, lead anchor kits, wire connector wrenches and nylon cable clamps, 38 page catalog No. 12-B. Holub Industries,
- (72) COMMUNICATIONS EQUIPMENT for the mining industry. 6-page folder 1601-9 covers speakers, speaker assemblies, amplifiers, microphones, telephone handsets, cable and junction boxes for either single

- or multiple channel operation. Mine Safety Appliances Co.
- (73) BATTERY CHARGERS. Bulletin GEA-6525A, 4 pages, describes 7 types of metallic rectifier battery chargers for motorized hand truck batteries. General Electric Co.
- (74) TV ANTENNA OUTLETS. New catalog describes complete kits for wiring entire residences for TV antenna outlets. Tevco Insulated Wire
- (75) ELECTRIC HEATERS are illustrated in full color in new catalog EC-199. Included are wall and portable heaters for big rooms and small rooms, radiant panel heaters, baseboard heaters and radiant heat cable. Electromode Div., Commercial Controls Corp.
- (76) UNDERFLOOR DUCT. Underfloor electrical distribution systems for concrete floors, steel deck floors, wood floors and floors with radiant heating are described in 56-page catalog 354-P. High- and low-tension service fittings are included. Walker Bros.
- (77) TRIP CONTROL for friction clutch and pneumatic or hydraulic paper cutters consists of locked control box, three limit switches, two hand-operated switches, a lockout switch and a clutch actuator. Described in 2-page form 84-283. Micro Switch, A Div. of Minneapolis-Honeywell Regulator Co.
- (78) INSULATING MATERIALS reference chart illustrates numerous applications of over 30 different types of materials, giving temperature class, gauge, type of backing, tensile and dielectric strengths and available finishes. Electro-Technical Products Div., Sun Chemical Corp.
- (79) ADJUSTABLE SPEED DRIVE selector in handy 4 by 9 fold-out form. Setting slide at desired horsepower gives appropriate ratings, frame sizes, dimensions and model numbers of Thymotrol drives. General Electric Co.
- (80) HOME LIGHTING. New 8-page 57-C catalog includes new bent glass designs and more than 20 new types of residential lighting fixtures. Project Fixture Mfg. Corp.



They cut your costs for four big reasons!

The complete Black & Decker line is POWER-BUILT to speed up your jobs!

Whatever Black & Decker Tool you buy, this you can be sure of: (1) It will be powered by the best electric motor in the business. (2) Its balance, compactness and lightweight mean easier handling. (3) It will be versatile, driving many accessories from among the 1,000 plus Black & Decker offers. (4) Its rugged construction means less down time, lower maintenance.

Those are the reasons why B&D Tools help you save time, cut costs, take the hard work out of tough jobs. And why industry has made Black & Decker the world's largest builder of portable electric tools!

See your B&D distributor for details—or write for Catalog No. 10 to: The Black & Decker Mfg. Co., Dept. 1211, Towson 4, Md. (In Canada: R. O. Box 278, Brockville, Ont.)

(1) Tailored Power — Heart of every tool is a motor completely built by Black & Decker and tailored to the tool's specific needs.

(3) Top Versatelity — Typically, this Sander does a variety of jobs...sanding, grinding, wire brushing, buffing, wood planing.



(2) STREAMLINED BALANCE —Like this Scrugun®, all B&D Tools are designed for easier handling, less operator fatigue.

(4) EXTRA RUGGED—This B&D Hammer, for example, handles the toughest jobs imaginable because it's power-built to last.



Quality electric tools . . . power-built to last!







UNI-TRAY Cable-Way

With Delta-Star's UNI-TRAY Cable-ways you reduce installation time up to 40% — substantially cutting cableway costs. Simply position the trays, then tap in Wedgit Fittings to connect sections. No bolts, pins or hinges to fit or tighten. UNI-TRAY Cable-way joints are assembled four times faster than with other type fittings.

Strong, lightweight expanded metal sections provide ventilation necessary for high current rating of cables — prevent collection of water and dirt. Continuous Wedgit contact areas provide excellent electrical contact for ground currents.

UNI-TRAY sections are available in hot-dip galvanized steel, with aluminum Wedgit fittings. Aluminum sections also available. A wide variety of shapes and sizes meet specific requirements.

Write for Publication No. 68—or see your Delta-Star man. Delta-Star Electric Division, H. K. Porter Company, Inc. 2437 W. Fulton St., Chicago 12, Illinois. District offices in principal cities.

H. K. PORTER COMPANY, INC.

DELTA-STAR ELECTRIC DIVISION

- (81) INDUCTION HEATERS for use on 60 cycles. 8-page bulletin includes installation photographs and a convenient frequency selection chart for steel bar stock. Magnethermic Corp.
- (82) Wiring Devices. Comprehensive catalog No. 2-57 gives ratings, specifications and pictures of appliance switches, lampholders, power outlets, weatherproof devices and other products. Slater Electric & Mfg. Co., Inc.
- (83) ELECTRIC BRAKES. 36-page illustrated report includes photos, drawings, diagrams and explanation of operation of newest electric brake designed for fail-safe applications. Warner Electric Brake & Clutch Co.
- (84) MAGNETIC DRIVE for application wherever variable speed is required. Eddy current clutch device ranging in horsepower from 10 through 310 is described in bulletin 4400-PRD-243. Electric Machinery Mfg. Co.
- (85) POWER SUPPLY for driving all industrial dc equipment. Silicon rectifier rated at 200 amps at 125 volts and 100 amps at 250 volts is described in new bulletin S125-200. Perkin Engineering Corp.
- (86) LARGE AREA LUMINAIRE is completely described and pictured in two new bulletins. Panelaire is a factory-assembled single unit in nine different sizes from 2 by 4 ft to 6 by 8 ft. Lighting Products Inc.
- (87) UNIT HEATERS. 26-page booklet B-1523 illustrates and describes in detail the construction and application of a new line of commercial and industrial unit heaters. Westinghouse Electric Corp., Sturtevant Div.
- (88) Frequency Converters rated at 25 and 30 kva provide 400 and 840 cycles, respectively, from 60-cycle line. Two new Nobrush Notations sheets give complete specifications and applications. Georator Corp.
- (89) BATTERIES—from theory to maintenance. 44-page Battery Users Manual has been developed as result of plant training courses and encompasses every phase of battery maintenance, repair and selection. Gould-National Batteries, Inc.
- (90) MAINTENANCE & PRODUCTION EQUIPMENT. 64-page Catalog 31 includes complete information for selecting and ordering tools and supplies for production equipment, electrical and motor maintenance

and safety equipment. Martindale Electric Co.

(91) LOAD CENTERS and plug-in circuit breakers for residential applications are described in detail in 12-page Bulletin GEA-6661. Included is a pictorial index of circuit breaker service entrance equipment. General Electric Co., Circuit Protective Devices Dept.

(92) ILLUMINATED CEILING TILE. Catalog 5-2, 6 pages describes white polystyrene Paragrid tile for overall ceiling lighting systems. J. A. Wilson Lighting & Display Inc.

(93) Indirect Luminous Ceilings. Large suspended fixtures for indirect lighting of ceilings are described and illustrated in 8-page Bulletin S-457. Included are sample calculations for lighting a general office and an elementary classroom. Silvray Lighting, Inc.

(94) CONTROL PANEL for coordinated control of squirrel-cage, synchronous, wound rotor and multispeed motors. Limitamp unit is described in 12-page Bulletin GEA-6331A, discussing applications, engineering features, maintenance, and components. General Electric Co.

(95) FLUORESCENT FLOODLIGHTS for high mounting at service stations. 4-page bulletin gives design and construction features, specifications, light distribution patterns and prices. Revere Electric Mfg. Co.

(96) FLUORESCENT TROFFERS. New line of recessed modular light units are covered in 8-page bulletin Z, including photos, specifications, dimensions, light curves, coefficients of utilization, and other engineering data. Pittsburgh Reflector Co.

(97) BALLAST PROTECTION. Bulletin MOPR-12 gives detailed information on why ballasts need protection, suggesting certain installations where protection is particularly desirable. Metals & Controls Corp.

(98) DISTRIBUTION TRANSFORMERS, Type OS, single phase, 15000 volts and below, 167 kva and below. 16-page catalog describes and illustrates every detail, including final inspection and crating. Complete tables give high and low voltages, taps, kva, catalog numbers and dimensions. Delta-Star Electric Div.

(99) FITTINGS & FIXTURES. Pocketsized catalog illustrates styles, lists dimensions, and constitutes handy on-the-job reference source. Killark Electric Mfg. Co.

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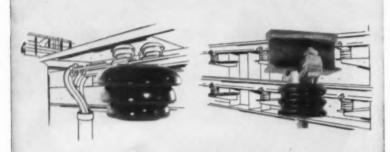
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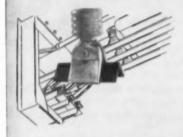




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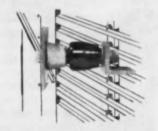
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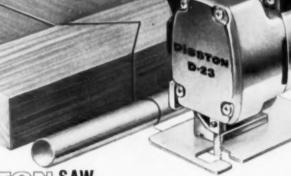
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DELTA-STAR ELECTRIC DIVISION

- (100) Pump Motors. 4-page Bulletin 2050 presents features of open, drip-proof, climatized vertical hollow shaft motors for shallow and deep well turbine pump applications. Louis Allis Co.
- (101) CONDUIT & CABLE FITTINGS. New 62-page Bulletin 85 presents in text and illustrations complete line of electrical conduit and cable fittings. Thomas & Betts Co.
- (102) LIGHTING FIXTURES for commercial and residential use. New catalog features Twist-'N-Turn hihats, spot-lighting accent lights, and pull-down and surface-mounted fixtures. Markstone Mfg. Co.
- (103) Transformers. Two 4-page folders present a summary of design policies, materials, workmanship and testing of OISC, OIEC, dry types, Askarel and nitrogenfilled types, and direct-burial, oil-immersed, earth-cooled types. ESCO Mfg. Co.
- (104) Service Equipment supplies complete line coverage, from 8 to 20 fused circuits. Add-On feature, permitting future installations of fuse sections, is described in 8-page Bulletin A-228. Arrow-Hart & Hegeman Electric Co.
- (105) INDICATING SWITCH. Three new spec sheets cover line of tiny indicating lights and switches designed primarily for remote control relays, Alden Products Co.
- (106) POWER CIRCUIT BREAKERS. Bulletin GEA-6599, 8 pages, and Bulletin GEA-6600, 8 pages, describe oil-blast interrupters providing 5-cycle interruption. Breakers are Type FK, 69 kv, rated 1000 to 5000 MVA, 600-2000 amps. General Electric Co.
- (107) WIRING DEVICES. 80-page Catalog 60 describes complete line in convenient pocket size, covering both interchangeable and conventional line. Pass & Seymour, Inc.
- (108) Coiled Cores—their characteristics, applications, construction and dimensions—are completely described in 16-page catalog, including check-list giving complete data for obtaining and ordering a self-designed cord for exact requirements. Cords Limited Div., Essex Wire Corp.
- (109) MOLDED CASE CIRCUIT BREAKERS. Bulletin GEA-6750 describes industrial line in ratings of 15 to 800 amps, giving enclosure information, ratings, modifications and accessories. 4 pages. General Electric Co.

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Reader's Quiz

QUESTIONS from readers on problems of industrial equipment, installation, maintenance and repairs. Answered by electrical maintenance engineers and industrial electrical contractors out of their experience. For every question and every answer published we pay \$5.00.

Checking Coils For Voltage

QUESTION V32—In the plant in which I work, we have a lot of makes of coils with numbers and without numbers but no voltage rating. Most of these coils are for solenoid valves in hydraulic systems.

I would like to know if there is any way in which to check these coils for the proper voltage.—A.P.

ANSWER TO V32—Since you do not know whether these coils are do or ac, you will have to determine the proper operating voltages for both dc and ac. All coils are so designed that they pick up at approximately 72% of the rated voltage, therefore the problem is to determine that point at which the coils pick up.

First, install the coils in the solenoid valves in which they belong. Then apply a variable dc voltage and note the pick up point. Next divide this voltage by 0.72 and you will arrive at the proper operating voltage. Repeat the process with a variable ac voltage and determine the proper ac voltage. If the core of the solenoid valve is laminated, then use the ac voltage. If the core is solid, use the dc voltage.—J.M.

ANSWER TO V32—I believe the best way to determine the voltage rating is to try the coils out at different standard voltages, such as 120, and observe the temperature rise. Start out with the lowest voltage in use on any of your machines and work up to the higher voltages. When, on any particular voltage, the coil reaches a surface temperature of about 100 to 120° F., you can figure that is the rated voltage.

Be sure to make or take from some old valves the iron field so that the coils are tested with a closed magnetic circuit. If tested without iron, they would overheat even at rated volts.—P.S.

ANSWER TO V32—Since no details other than the omission of voltage rating of the coils is stated, a description follows of a method used in a somewhat similar situation. The location was in a remote area and the operating conditions

had to be restored as soon as practicable.

Inspection indicates that either 125 or 250 volts ac were available and the first series of tests was the measurement of the resistance of each coil. This was done by applying low voltage from a battery and calculating the value from the ratio of volts divided by amperes. Then knowing the value of resistance. the approximate current value at any voltage could be calculated from the ratio of volts divided by ohms resistance of the coil. While it was possible in some instances to identify from its dimensions, the value with which a coil could be used, it was necessary to determine within reasonable limits what heating of the coil would be during actual operation from the temperature rise with the expected current value.

The rise was estimated by impressing rated voltage for 30 seconds and then measuring the increase in coil resistance at the particular current from the formula:

$$T = (234.5 + t) \left(\frac{Rn}{Re} - 1 \right)$$

where T = temp. rise in degrees centigrade

t = temp. degree centigrade by thermometer at which cold resistance is measured

Rc = resistance in ohms at temperature t

Rn = "hot" resistance in ohms at end of test

The maximum temperature was assumed to be 100° centigrade and an addition of 10° was added to the value obtained from the formula to indicate what the "hot spot" value might be since no details of the internal type of insulation was known.

While the foregoing method seems rather crude, it served its purpose completely for the conditions existing at this installation. For some operations periods longer than 30 seconds did not cause overheating.—C.O.D.

Communication Systems

QUESTION W32—Our local YMCA built about 1914 has an Annunciphone No. 3283 1914 from the Sampson Electric Co., Canton, Mass. As this firm is out of existence, it is impossible to get a diagram or parts from them so I would appreciate any information your readers might offer to service this phone system.—R.S.B.

ANSWER TO W32—Anytime when the firm that made an item is not in a position to supply parts or information, I just make a rough sketch of the job that the item has to do and then I add parts. A radio parts catalog, a Couch and an Edwards catalog can be of help in modernizing the system.—H.S.

ANSWER TO W32-Attempts to keep antique communication systems in working order are so costly in labor that they are rarely worthwhile. But if replacement is impractical and the customer is willing to pay for the time, a single instrument should be removed and its wiring traced and diagrammed. Be sure to keep the connecting wires identified. The type of operation should be checked, as common or selective talking, etc., and the battery voltage. Then a current catalog should be consulted for equipment matching the diagram and type of operation, and a new unit tested in place. Replacing individual components and parts, with the exception of cords and receivers, is rarely practical.-M.K.

Use of Generators

QUESTION X32—Where would it be advantageous to use generators, which have a very high reactance, besides in hazardous locations and where many people congregate or as welding generators? What percentage of the total generator kilowatts on land are in hazardous locations or where many people congregate?—E.B.

ANSWER TO X32—These generators are perfect for charging batteries. By changing the field coils or by reversing the series field coil connections, you can change the generator characteristics. I would also test the exciter voltage. If it is low, you will get high reactance.—H.S.

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Can You Answer These QUESTIONS

QUESTION E33—I heard two engineers discussing the I.C. of circuit breakers and high voltage fuses; one said it depends only on the available short circuit current of transformers; the other said it also depends on where on the system you are to add circuit breakers or fuses. He also said that as you go down the line of interruptors, each consecutive one may be smaller and compared it to walking down a stairway. Which of the above engineers is right and why?

—M.D.

QUESTION F33—In our plant, we have three 50 kva, 440/110-volt transformers connected 3-phase delta-delta. For nine hours it carries a 10% overload, for six hours it carries 60% of full load, and for the balance of the 24 hours the load fluctuates between 60% and full load. The 24-hour rms value of this current is about 94% of full load. Is it safe to operate these transformers at the above load? If not, what is an economical solution to the problem.—J.M.

QUESTION G33—If 3-phase and single phase service is available, is it cheaper to operate 3-phase motors instead of single phase motors? What is the comparative cost of operation based on same horse-power ratings?—G.J.P.

QUESTION H33—How is it possible to determine the lead numbers on a 3-phase, 9-lead motor after all lead numbers are destroyed or cut off? Circuits can be lamped but how could the numbering be determined?—E.S.H.

QUESTION J33—How do you calculate the ohms of resistance for a field rheostat for dc speed adjustment?—J.R.

QUESTION K33 — How can one properly fuse a 7½ hp motor? Some codes insist that a 60-amp motor switch must be used although the 7½ hp, 3-phase, 220-volt motor needs not more than a 25-amp fuse-tron.—H.S.

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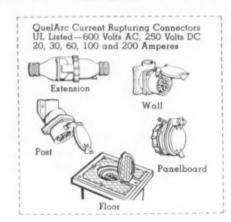
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Questions on the Code

Answered by:

B. A. McDONALD, New York Board of Fire Underwriters, Rochester, N. Y. GLENN ROWELL, Electrical Engineer, Fire Underwriters Inspection Bureau, Minneapolis, Minn. B. Z. SEGALL, Consulting Electrical Engineer, New Orleans, La.

Transformer Vault

Q. Will this room serve as transformer vault for 300 kva (3-100) bank? Room is inside of building below grade and ground level with no outside ventilation.—T.D.S.

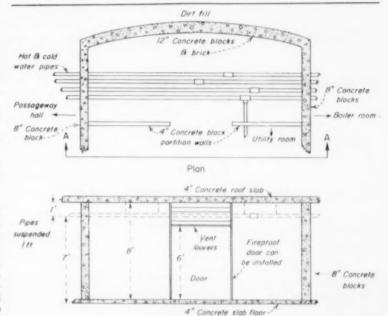
A Provisions for transformer vaults are covered by Sections 4541 to 4548, inclusive. Also Section 4523a permits a slight relaxation of these general requirements if the total vault capacity is 112½ kva or less—a condition not applicable in this case.

First off, the location is not the best desired and is of course at variance with the requirements of 4541. The phrase "if practical" is used to cover such situations as is shown in the diagram and does therefore, permit the installation as far as general location is concerned. However, it will be found that ventilation usually would be required to conform to Section 4544. So I would say that the vault would not conform to the code since you do not plan to have any outside ventilation.

As far as the general construction details of the vault are concerned, the sketch shows a vault that is definitely not up to minimum code requirements. A 4-in. thick concrete roof slab is below the 6-in. thick reinforced concrete minimum code requirement. The two 8-in. concrete block walls are also below the 12-in. load bearing hollow concrete building units required by minimum code standards. Possibly it is planned to use the 8-in, blocks and fill them in and they may then conform to the ASTM Fire Test Standard E119 as to strength requirements and as to the 24-hour minimum fire resistance requirements. This would, of course, have to be determined from the make and type of block it is proposed to use.

The door will definitely have to be fireproofed. In addition the other requirements for the sill and the lock, as shown in this Section 4543, must be complied with.

Ventilation and the necessary opening to provide proper ventila-



Elevation A-A

tion are covered in Sections 4544 and 4545. Your vault does not provide for this and is in violation of the Code requirements.

No drain is shown. Section 4546 requires this in all vaults having in excess of 100 kva transformer capacity. The floor is shown as level whereas it should be pitched towards the drain.

The hot and cold water pipes should not be within the vault. However, it is realized that at times we cannot avoid their being so located. If these foreign pipes must be within the vault (as they must in many cases where the vault is being installed in an old existing building), then any valves or other fittings (other than say straight couplings, tees, ells, etc.) must definitely be kept out of the vault. These valves, etc., must be maintained and it is quite hazardous to send into these vaults other than qualified electrical men, who in most cases are not permitted to maintain such equipment.

Section 4548 requires that store rooms etc., be kept out of the vault proper.—B.Z.S.

Service Drop Clearance

Q Section 7324 of the code requires clearance of 8 ft where wires pass over building roof. In many installations, we have extended conduit, 2 in. or larger, from meter socket up through roof and attached service drop to this conduit. Since meter socket is on outside of wall, the service passes over only the roof overhang. We have heard of no objection to this.

We now have several one-story, flat roof school buildings, entrance shown through wall at ceiling. On account of low clearance above ground, and insufficient wall strength at the top, the architect has asked that we extend conduit from main switch up through roof and attach service drop to this conduit (2½ in. and 3 in.). This will have service wires pass over roof for a distance of 12 ft.

We would like to have your opinion as to clearance required in such an installation.—O.M.R.

A. I personally believe that the provisions of Section 2322-a



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WISCONSIN, MILWAUKEE R. M. Johnson 831 Blake Ave. South Milwaukee, Wis. Phone: So. Milwaukee 2-8585 as well as Section 7324 apply in the case described, and a minimum 8-ft clearance is required over the roof of the school building described. As you say, I don't believe there has been any serious objection when the service drop conductors only pass over the eaves of over hang, but I doubt if any inspector would accept the installation described unless a full 8-ft clearance is provided.

In order to obtain this clearance, it might be necessary on some installations to extend the conduit 9 or 10 ft above the roof, provided the length of span and the sag were factors to be considered. At any rate a conduit riser above the roof of such length should be supported to a rugged structure provided for the purpose. When long spans are involved it may be necessary to install an extra pole near the building so that the final span from pole to building would be short. The electric utilities usually are concerned with the facilities available for supporting their service drop conductors. In view of the foregoing, it may be desirable to install an underground service. B.A. McD.

Service Requirements— Multiple Occupancy

Q. What section of the 1956 Code would require additional disconnecting and over-current devices at 4 points marked with a question mark adjacent to the meter?—F.O.D.

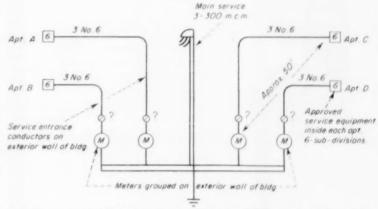
A. Under the conditions shown and described by your illustration, I know of no code re-

quirement which would require additional service equipment to be installed at the points marked "?". According to the provisions of Section 2351-a, a multiple-occupancy building which does not have individual occupancy above the second floor may have service conductors run to each occupancy, and the service equipment for each occupancy may consist of not more than six switches or circuit breakers. Section 2301-b further emphasizes this point. Section 2371a-4 also recognizes six sets of fuses or circuit breakers in each occupancy. There is, in my opinion, no code violation with your layout .--B.A.McD.

Underground Feeders

We plan to do the wiring on a new summer resort now being erected near here, which will consist of a main lodge and 20 individual cabins, For appearance purposes, we wish to serve the individual cabins by underground feeders. If each of these feeder runs to the individual cabins is properly fused at the distribution panel in the main lodge, will it be necessary for us to install a regular service switch in each cabin? We plan to have two circuits in each cabin not provided with cooking facilities and four circuits in the cabins which have kitchens. - A.P.D.

A Providing overcurrent protection for the underground feeders will not remove the necessity of installing service switches in each of these cabins as para-



Main service conductors, 300 m.c.m., outside building wall. Individual service entrance cond's No.6, outside building wall. Each apartment (A-B-C-D) has approved service equipment 6-subdivisions, taken from the individual No.6 service entrance conductor. Panel in each apartment-not above the second floor.



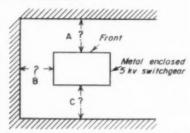
graph d. under Section 2351 reads as follows:

"In a property comprising more than one building under single management, the conductors supplying each building served shall be provided with a readily accessible means, within or adjacent to the building, of disconnecting all ungrounded conductors from the source of supply. In garages and outbuildings on residential property the disconnecting means may consist of a snap-switch, suitable for use on branch circuits, including switch controls at more than one point."

In view of the fact that these cabins would be other than out-buildings, it would not, of course, be possible to use an ordinary snap switch designed for use on individual circuits. However, the switches used would not have to be rated as service switches as they would only need to be capable of opening under the load to be served by them.—G.R.

Working Space About Electrical Equipment

Q. What are the minimum Code requirements for the installation of a 5-kv metal enclosed switchgear as shown by illustration?—R.D.M.



What are minimum code requirements?

A • know of concerning the installation in question is Section 7124 which reads as follows:

Section 7124. "Working Space. Working space not less than the distances given in Table 33, Chapter 10, shall be provided in locations where it is necessary to work in close proximity to live parts."

It should be noted that this rule applies to installations accessible to qualified persons only and is intended to provide safe working conditions for such persons. It is also important to note that the rule only applies when it is necessary to work in close proximity to live parts. According to Table 33, a 3-ft 4-in, clearance would be re-

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Lantx Manufacturing Co., Inc. Dept. 117-A, Valparaise, Indiana quired on a system operating between 2300 volts to 6,600 volts.

In the example shown, I believe the minimum distance "A" would be 3 ft 4 in., assuming that the switchgear is of the stationary type. If however drawout breakers are involved, it may be necessary to increase the space. If the switchboard is a type where all servicing may be satisfied through the front of the board, I do not believe there are any Code requirements covering the B or C dimensions, provided there are no access panels provided for servicing. If access panels were provided on the "C" and "B" sides, the 3 ft 4 in. spacing would be required. B.A.McD.

Conductors in Multiple— Single Phase to 3-Phase

A would like a code interpretation of the following: We have a school building with two 500 mcm in parallel for lighting and single phase power. They are now adding 15 hp 3-phase. We have ample capacity in the two 500 mcm for the additional load. Will it be necessary for us to parallel two 500 mcm for the high leg of a Delta system or can we parallel two No. 1/0 for this as 1/0 is the smallest conductor that can be paralleled.—R.G.L.

A. In order to visualize the problem presented, I have shown by Fig. No. 1 the single

phase, 115/230-volt service which now exists; and I have also shown by Fig. No. 2 your proposal for bringing the third phase to the new 15 hp 3-phase motor load by installing two 1/0 conductors in parallel. I assume that the problem only concerns the service-entrance conductors which terminate in the service disconnecting means.

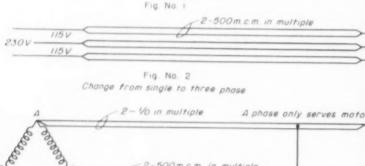
Insofar as the code is concerned, I am unable to find any provision which would deny the use of the procedure outlined. It appears evident that the B-C phase will continue to carry the single phase load and also the additional load of 40 amps serving the motor. On the other hand the A phase only supplies the motor load. According to Section 4312, the motor branch circuit conductors shall have a current-carrying capacity of 125% of the full-load current rating of the motor, which in this case would be 50 amps. This raises a question with respect to running two 1/0 conductors in parallel, which in the case of "R" insulation have a current-carrying capacity of 250 amps. I personally do not believe this would be required and a single 1/0 conductor would serve the purpose without violating the code, provided you do not anticipate additional 3-phase loads in the future.

I assume that the service in question is run in a metallic raceway. As a result it would be necessary to see that the new conductors are arranged to avoid inductive heating as covered by Section 3018. They

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could not be run in a separate conduit independent of the other phase wires. I note your advice that there is ample capacity in the two 500 MCM cables, and this is important since a variation in voltage over the phases in the motor could influence its proper operation.—B.A.McD.

Indented Couplings— EMT

One question concerns the electrical continuity of the grounding circuit where electrical metallic tubing is used after passing the service equipment. Does the use of indented couplings for joining sections of EMT comply with Article 300, Section 3016?—E.J.F.

A Underwriters' Laboratories under the heading of "Electrical Metallic Tubing Fittings" list several manufacturers who fabricate connectors and couplings, suitable for use with metallic-coated electrical metallic tubing only, and requiring a special tool supplied by the manufacturer for proper installation. Usually two sets of diametrically opposite indentations are necessary for each connection to tubing. There is one connector however which requires three sets of indentations. See page 59, U.L. Materials Listing.

This approval by U.L. indicates that the general provisions of Section 3016, which concerns the electrical continuity of metal raceways and enclosures, will be satisfied when such approved indented connectors or couplings are used as described by U.L. The approval further indicates that these fittings have performed satisfactorily under test prescribed in the standard established by U.L.—B.A.McD.

Service Entrance Cable

The use of service entrance cable. How should cable be supported to building? Could cable be used on open span between buildings?—A.J.B.

A Service entrance cables come in a variety of forms. Article 338 lists the three general types. Any one of these three types may be attached directly to the building with straps or clamps. Under some conditions, however, the unarmored Type USE or Type SE may be required to have a pipe



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LIGHTING SPECIALIST:
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CENTURES 10-35

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or conduit for additional mechani-

If these cables have all their conductors fully insulated they may be used more or less for general wiring installations of all types provided for by the other requirements of the Code. For example, the armored type ASE would be installed in accordance with the requirements for armored cable (BX) as shown in Article 334; the unarmored types USE and SE, in accordance with the requirements of Article 336 for Non-Metallic Sheathed Cables.

However, these cables are usually supplied with the neutral conductor, uninsulated, and under these conditions its use is quite limited. The cable may be installed to serve

1. an electric range, or

- 2. an electric clothes dryer, or 3. a domestic water heater, or
- 4. as feeders from a service cabinet to supply other buildings, or

5. as service entrance conductors for such other buildings.

When this uninsulated type is used for such conditions it must conform to the following restrictions:

1. The cable must have a final non-metallic outer covering which shall enclose all conductors, the insulated as well as the uninsulated conductors,

 It cannot be used on any other circuit except an alternating current circuit rated at 150 volts to ground or less.

3. It shall supply the water heater with fully insulated conductors only, but the uninsulated conductor may be used for grounding purposes.—B.Z.S.

Current Limiters Ahead of Main Disconnects

The C. T. Electrical Controls Ltd. of Brandon, Manitoba, Canada, with a field office at Room 618 Florida National Bank Building, St. Petersburg, Fla., are marketing several load limiting devices. One of these is £100 D. This item consists of a sealable steel cabinet 16 in. by 17 in. by 5 in., a 2-pole ampere measuring device which actuates a micro-switch to make contact at an adjustable ampere valve, and a switching device to apply 120 volts to certain 240-volt loads and thus reduce or limit the ampere demand. The above-named measuring device is



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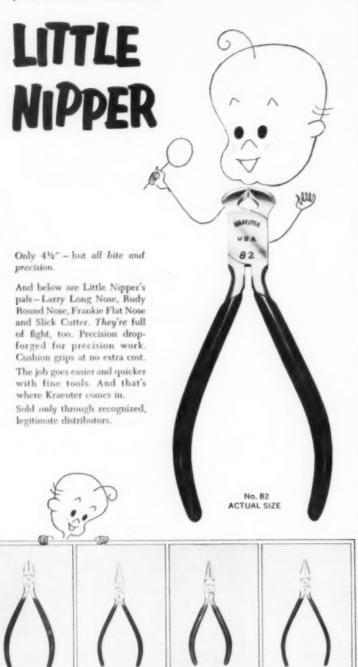
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said to be, (by Mr. Marvin Black of the manufacturer's field office) and appears to be the same, as their 100-amp 2-pole breaker which is approved for use as service equipment except that the circuit opening parts are absent. (Fault current interrupting capacity 10 ka.) May this ampere measuring device (not the switching mechanism) be installed on the line side of the service disconnect the same as a watthour meter? Some of our Utilities require the use of these regulators on domestic space heating loads .- C.H.A.

Section 2352 of the N. E. Code recognizes the installation of service fuses and meters ahead of the service disconnecting means. I assume the service overcurrent device is integral with the service disconnect, and a question of installing the load limiting device ahead of the service overcurrent device is also involved. As a result the rules covered by Section 2375 are also concerned. When these rules were formulated several years ago, I doubt that the load limiting device described was considered, and I personally believe it should not be considered as a meter or measuring device. As a result, the installation of such a type of equipment ahead of the main switch would be a violation of the original intent of the code. This opinion appears to be verified by the fact that similar types of peak load limiting devices, which are approved by the U. L., are not listed as service equipment.

Insofar as electrical Utilities are concerned, it is my impression that they would be adverse to the installation of such devices ahead of the main disconnecting switch. In addition to the hazard presented, the question of maintenance would become a Utility responsibility which I doubt they would desire to assume. It is also difficult for me to visualize any condition of use which would require the proposed sequence. Outside of an outdoor meter installation the main disconnecting switch may be installed ahead of a meter, or a current limiter, and this also may be done in the case of the outdoor installation when weatherproof equipment is used, or the equipment is otherwise protected from the weather.

There are several peak load limiting devices which are approved by U. L. to regulate electrical spaceheating loads, and they may be applied without involving any question with respect to service equip-

ment.-B. A. McD.













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PART III

By George Kossoy*



Third in a series of three articles for electrical contractors recommending security measures to provide for the continuity of the firm and the preservation of assets.

OU ENJOY other benefits if you plan for the future. These benefits save you dollars. Your responsibility to the Government of the United States does not end when you die. The Government requires that your estate file an Estate Tax Return if your gross estate exceeds \$60,000. A person who has carefully planned his future can effect financial savings on Estate Taxes. If you don't take the trouble to find out what these advantages are, you may dissipate a good part of the estate which you worked so hard to create.

What is included in the gross estate? Everything, including life insurance owned by you. Your estate consists in the main of life insurance, a business interest, your home, bank accounts, stocks, bonds and other securities. In order to determine what the value of your estate is for Estate Tax purposes, all of these items must be reported and valued in your Estate Tax Return. It should be quite obvious to you that the higher the valuation. the higher the tax; and conversely. the lower the valuation, the lower the tax.

Examine your assets. You will find that substantially all of them have a value that is easily determined. Your insurance has a death value; your bank accounts have a cash value; your securities have a market value; real estate is valued on the basis of a fair appraisal. But what about your business? How is that to be valued?

The valuation that you place upon your business interest and which the Government will accept has to be a fair value. A proper stockholder's agreement may fix a value or set up a formula on which a value may be calculated. If you fail to do this, then the Estate Tax Return examiner has a right to adopt any one of several formulae that are commonly used in appraisal proceedings.

One basis for valuation is capitalization of the average earnings of the corporation for several years prior to death. This can be disasterous, because, in adopting this method, effect is given to goodwill. In addition, the average may be unduly high because of the inclusion of some year of abnormally high earnings. The burden of establishing the abnormality is not easily met and overcome.

Valuation of a business interest is a critical item in the return, both for the corporation and the estate, and therefore a formula should be carefully worked out.

You can effect a further tax savings by utilizing the advantages of the marital deduction provisions of the Internal Revenue Code.

The marital deduction principle, reduced to its simplest terms and without going into its technical aspects, provides that under appropriate provisions what you leave your wife outright or in a trust, giving here the right to dispose of

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the principal by her Will, is tax exempt to the extent of 50% of your gross estate. In addition, there is a specific exemption of \$60,000. Thus, where the taxable estate is \$300,000, if you take proper and full advantage of the marital deduction provisions, the taxable amount may be reduced to \$90,000-the reduction consisting of \$150,000 for the marital deduction and \$60,000 for the specific exemption. The tax on a \$300,000 estate without a marital deduction is \$59,100, Giving effect to the marital deduction, it is only \$17,500. The wide variance is due to the fact that the marital deduction comes off the top of the estate where the rates are highest. Accordingly, if you cut the taxable estate in half, you always reduce the tax by more than half. Here are some examples of savings that can be made if Wills are drawn which give full effect to the marital deduction provisions:

	Federal	Federal
	Estate	Estate
	Tax	Tax
	Without	With
Taxable	Marital	Marital
Estate	Deduction	Deduction
\$100,000	\$ 4,800	\$ 0
200,000	31,500	4,800
300,000	59,100	17,500
400,000	87,700	31,500
500,000	116,500	45,300

I don't want you to get the impression that I have covered the entire field of estate planning. It was my thought that if I pointed out a few things they might stimulate you into doing something for yourself and your family.

If you have a business agreement or a Will, they should be reviewed frequently. If you are without a business agreement or a Will, you should remedy this situation promptly. Planning for the future is not static—it must be kept up to date. Changes in your financial or personal affairs; changes in the tax laws; or other changes not readily foreseeable may call for a revision of your business agreement or Will. Your entire planning for the future and all of its details should be reviewed very frequently.

The principle of constructive estate planning is not novel. Unfortunately, howover, it is quite often a subject for conversation rather than affirmative action among businessmen, between husband and wife, and between client and lawyer.

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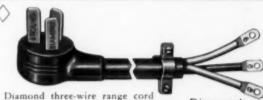
Flexible steel armored cable ideally suited for general lighting and wiring in non-fireproof homes. Available in two, three and four conductor.

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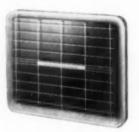
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In The News

Midwest Inspectors Censure Circuit Breaker Substitution

Two lively symposia and a Code Forum comprised more than half the agenda of the 53rd Annual Meeting of the Western Section, IAEI, at the Hotel Sherman, Chicago, September 23-25. More than 400 electrical inspectors and other industry representatives benefited from field experience reports covering aluminum conductors, interchangeable circuit breakers, grounding methods and other code problems. Floor discussions were invigorating and informative.

A note of concern was injected into the opening session when International President Harold S. Morr, Salt Lake City, noted the effect of inflation on the association's budget. Retrenchment in the form of curtailed services to the 9,000 members is in the offing. Under consideration are: elimination of Chapter visits by international office personnel; no mailing of new codes to members; elimination of financial support to the National Electrical Week promotion after the current campaign; careful editing of the verbatum Section meeting proceedings to reduce the \$9,000 annual printing bill; transfer of certain bulletin advertising agency functions to the international office in Chicago. Such stopgap measures should place the IAEI on a sound financial basis within one year, Mr. Morr reported. However, return to international office chapter visits will eventually require addition of a third man and added income, probably from increased dues. Members were urged to keep these problems in mind and to remember that IAEI's objectives are limited exclusively to the development and promotion of electrical safety standards (N.E. Code); improvement of installation and inspection methods, and promotion of industry and public cooperation.

That these objectives must be maintained was reiterated by E. F. Cogan, assistant technical secretary, IAEI as he noted that increased use of electricity in homes has increased the hazards of outdated wiring. Latest fire statistics indicate that more than 30% of fires attributed to electrical origin have been traced to "worn-out"

electrical equipment and wiring systems, he reported.

1959 Code Timetable

The 1959 edition of the National Electrical Code will be available about Sept. 1959, C. L. Smith, secretary, NEC Committee announced. In the interim, some 142 members of Code Making Panels are working within the following deadlines: Dec. 31, 1957-final receipt of revision proposals; May 1, 1958-panels submit formal reports to Correlating Committee; July 1, 1958-panel reports published for distribution to Electrical Section, NFPA, members; Jan. 30, 1959-Code Making Panels, after study of industry comments, make final reports to Correlating Committee; May 20, 1959-Correlating Committee submits reports to NFPA for printing and distribution; Following NFPA approval and submission to American Standards Association, the revised edition of the NEC will be available in Sept. 1959.

In connection with the 1959 Code, Walter E. Stewart, St. Louis, chairman, Western Section NEC Committee, reported the following proposed revisions have been returned to the appropriate Code Panels for consideration: A change in Section 2115-b to require two 20-amp small appliance circuits in the kitchen and other specified dwelling areas instead of the "one or more" now indicated.

2. A change in Sections 2322-a and 7324-a to require minimum 8-ft clearance for service drops and outside wiring over any roof regardless of conductor voltage.

3. In Section 2331, make mandatory the fine print note dealing with overcurrent protection for service entrance conductors run within hollow spaces of a frame building.

 A request that Section 2324 include rules covering installation of service masts.

5. A proposal to discontinue recognition (Section 2582-b) of an underground gas piping system as an acceptable grounding electrode.

Aluminum Symposium

The practical and economic use of aluminum products in an electrical system was the subject of a spirited 3-hour panel and forum session, moderated by NFPA field service engineer C. L. Smith. With aluminum being about 800 times more prevalent than copper in the earth's crust, the metal's availability and price stability is virtu-



KANSAS INSPECTORS have a private "code session" during a break at the Western Section, IAEI annual meeting in Chicago. Participating in discussion are (L to R) G, M, Lancett and R, Longstaff, Wichita; D. M. Lines, Topcka; Albert Karl, Kansas City, Kansas; and C. J. Anderson of Burlington.

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NEW PRESIDENT, Western Section, IAEI, E. H. Rueppel (right), Louisville, Ky., receives symbolic gavel from R. C. Loughead, Detroit, at Chicago convention. A woodworking hobbyist, inspector Loughead has turned out professional-type gavels for many a Western Section president.

ally assured, reported Roger Keith, Kaiser Aluminum Co. Keith noted the weight and overall cost advantages of aluminum wire, reviewed its physical properties and in general predicted a bright future for the material

Discussing the techniques of making aluminum cable connections, M. D. Bergan, Thomas & Betts Co., reiterated the need for removal of aluminum oxide from the bare aluminum. Thermal expansion is the biggest factor contributing to aluminum cable connection failure and the best way to overcome that is to use aluminum lugs-even on copper cables, he added. Keith revealed that a new UL approved hot-tinned aluminum lug is now available for use with both aluminum and copper conductors; also an end-to-end adapter connector for aluminum to copper conductor splices at panels. Pressure type connectors were definitely recommended.

H. H. Watson, G. E. Co., reported no appreciable difference between loaded, cycled, duplicate aluminum and copper conductor circuits under a research weather test; recommended cable ends be cleaned with a worn file or wire brush. Embedded particles from sandpaper or emery cloth can increase the resistance of aluminum connections. Watson cautioned switch and panel-board manufacturers to design enclosures big enough to take aluminum cables.

Prefabricated aluminum bus duct should be installed the same as copper duct. Since the aluminum bars are pre-coated to prevent oxidation, they should not be brushed or cleaned at connection points, warned Kent Stiner, Bull Dog Electric Products, Co.

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aluminum products were presented by J. Raymond Meehan, vice president, Fischbach, Moore & Morrissey, Inc., Chicago. The light weight, non-magnetic, non-sparking, non-corrosive features of aluminum conduit are definite advantages, he noted, as are the lowreactance of aluminum bus bars. Use of special dies for threading and lubrication of all aluminum conduit joints were recommended. Termination of small size aluminum wire, particularly on machine tool controls, should be made with lugs, he added. Field experience indicates that when aluminum conductors are used, terminal boxes on motors should be oversize. Meehan concluded.

General floor discussion revealed little trouble with aluminum systems. Good experience with residential service entrance drops was generally attributed to the fact that service cables are seldom, if ever, loaded to capacity on a cyclic basis. General consensus was that aluminum wire should be limited to sizes above the branch circuit

category.

Censure Breaker Substitution

Abuse of the interchangeable convenience of snap-in type circuit breakers by do-it-yourself "mechanics" was evident at an inspector problems symposium moderated by William P. Hogan, chief of the Chicago electrical inspection bu-reau. In general, larger capacity breakers are being substituted for 15-amp breakers without changing branch circuit conductor sizes. This creation of a definite safety problem in various sections of the country has been brought to the attention of the National Electrical Code Committee. Reports at this session indicated that circuit breaker manufacturers are now working on a means to retain interchangeability within specific ampere ratings but preclude substitution of large breakers for small ones.

Vigorous floor discussion, both pro and con, led to unanimous passage of Western Section, IAEI resolution recommending that Code Making Panel 4 consider a proposal to:

Amend Section 2481 of the National Electrical Code so as to-

- 1. Classify circuit breakers as to ampere rating as follows: 0-20, 21-60, 61-100, 101-200,
- 2. Make it mandatory that circuit breakers be non-interchangeable within the above limitations.
 - 3. Confine these restrictions to



GENERAL CHAIRMAN of 1957 Western Section, IAEI annual meeting, S. R. Todd, accepts avation of convention delegates at recent Chicago conference. Mr. Todd is a past international president of the inspector organization.

single or double-pole, single-phase breakers in residential or commercial occupancies where there is no competent supervision 24 hours a day.

Panel and floor discussion of inspector problems during the remainde of the forum included such subjects as: system and appliance grounding techniques, with special attention to metal-enclosed portable TV sets; feeder sizes for ligting panels; heat ratings of concealed "hi-hat" fixtures; and circuits to divided ranges (table-top range and built-in ovens). Inspectors were advised that a special technical committee is now studying the range circuit problem.

Panel members included Gordon Brown, Chicago; H. B. Love, Detroit; J. E. Fisher, Elkhart; E. H. Rueppel, Louisville and J. Gordon Maltby, Evanston.

Individual code interpretation problems were resolved at the regular Code Forum. Members of the National Electrical Code Committee in attendance were on hand to answer prepared and floor questions.

Business Session

The growing need for a more effective public relations program was stressed by A. H. Welklin, Ft. Wayne, Ind., chairman of the Public Relations Committee. With the increased use of electricity, inspectors need a diplomatic but firm approach to the public in this educational endeavor. In addition to the usual use of TV, radio and newspaper media, Welklin suggested inspectors use display kits for lecture-demonstrations. He also suggested development of a Public Relations Manual to guide



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DEEP THOUGHT is given to appliance grounding problems by (L to R) Martin Streed, chief electrical inspector, Minneapolis, Minn.; and G. E. Manning, Underwriters' Laboratories, Chicago, during casual confab at recent Western Section, IAEI meeting in Chicago.

local inspectors in devising their own programs.

New Western Section officers elected at the final session included: president—E. H. Rueppel, Louisville, Ky.; first vice president—L. S. Crain, Lincoln, Neb.; second vice president — W. E. Stewart, St. Louis, Mo.; secretary-treasurer—H. L. Parks, Charleston, W. Va.

Members of the Executive Committee are: W. P. Hogan, Chicago; H. B. Love, Detroit; C. B. Tressel, Canton, Ohio; L. W. Roper, Council Bluffs, Iowa; L. E. Peterson, Sycamore, Ill.; R. S. Davis, Detroit; and past-president R. L. Thompson, Albuquerque, N. M.

Elected as Western Section representatives to the IAEI Executive Council were: George Monroe, Springfield, Mo.; A. H. Welklin, Ft. Wayne, Ind.; H. L. Parks, Charleston, W. Va.; and C. M. Park, Chicago, as alternate.

At this 53rd annual convention, the Western Section honored its founder - 90-year old William Stowe Boyd of Chicago. Back in 1905, Mr. Boyd met with 19 electrical inspectors in this same hotel and founded the Western Association of Electrical Inspectors. In 1928, this organization became the Western Section, International Association of Electrical Inspectors. For his lifetime of untiring effort in behalf of better electrical safety and inspection service, IAEI secretary C. L. Smith presented Mr. Boyd with a diamond IAEI lapel

Next year, the Western Section meeting will be held in Detroit, Mich. Milwaukee, Wis., will be host to the Section in 1959 and tentative plans list French Lick Springs, Ind. for the 1960 meeting.



IAEI PRESIDENT H. S. Morr, Salt Lake City, acquaints Western Section members with IAEI's operational, administrative and financial problems. Some established services face temporary curtailment, he advised Chicago meeting.

400 Delegates Attend Eastern IAEI Meeting

Over 400 delegates attended the 33rd annual meeting of the IAEI's Eastern Section which convened this year at the Bedford Springs Hotel, Bedford, Pa., during the period of October 7-9. During this brief interval, over a dozen technical discussions were presented, three Code breakfast sessions prompted enthusiastic participation, while two business meetings included the election and reports of officers.

In the category of technical discussions, H. H. Watson, General Electric Co., and Chairman of Code Making Panel No. 2, spoke on "Diversity, Derating and the 1956 Code", analyzing the nature, characteristics and average durations of various types of electrical loading, and considering the related sizes of service entrance, protective and control equipment, feeders and branch circuiting. Mentioning how appliances are rated on the basis of permissible temperature rise, effectiveness of insulation and laboratory test data, he then showed why the Code advocates derating of various wiring mediums in the interest of public safety.

Another interesting subject was the general one of aluminum; with C. P. Xenis, Division Engineer, Consolidated Edison Co., New York City, speaking on aluminum as an electrical conductor; Martin Bergen, Engineering Technical Director, The Thomas & Betts Co., Elizabeth, N. J., speaking on aluminum connectors, and Henry Kluver, Kaiser Aluminum Co., speaking on economic factors involved in the use of this material

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PRESIDENT-ELECT E. B. Fetty (left), Chief Electrical Engineer in the Department of Licensing and Inspection at Washington, D. C., receives congratulations from outgoing president John W. Hager, Ass't. Superv'g. Ch. Inspector for New York City. Election took place during the Section's 33rd annual meeting at Bedford Springs, Penn., October 7-9.

These three discussions were comprehensive in their scope, for they collectively related utility company experience with lightweight overhead distribution systems, the making of effective connections in small spaces, the problems of oxide coatings and cold flow of the metal, reasons for using aluminum for specific applications, factors governing the selection and installation of aluminum buses and cables, a comparison of resistances related to different types of bus connections, techniques of welding and bolting. thermite connections and soldering, the use of crimped lugs and sleeves, code recognition and regulation, economic considerations, and variations between theory and practice.

In discussing "The Future of Higher Utilization Voltages", Robert F. Lawrence of Westinghouse reviewed the initial acceptance and present applications of 460/265volt 3-phase 4-wire distribution systems in modern industrial and commercial buildings, stressing many economic factors that contribute to the desirability of power transmission at this level. Predicting continued and increased use of 460/265 volts in these fields, he particularly cited the potential of fluorescent lighting, large motors and electric cooking.

Large apartment houses are another source for 460/265-volt utilization, he stated, mentioning that some buildings of this type in Chicago already are purchasing utility service at this voltage level and are then installing dry-type step-down transformers within individual apartment units to supply 120/240



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Will be Paid by McGraw-Hill d Pub. volts where necessary. Still another promising field for 460/265-volt use is in new residential areas, he continued, where highly-electrified homes are including electric ranges, clothes dryers, water heaters, heating and air conditioning units. This trend was illustrated by discussing already-constructed housing developments of this nature which are located in such widely-scattered areas as Arkansas, Florida, Illinois and Louisiana. Many all-electric homes in these areas already are using current at the rate of from 12,000- to 25,000-kwhrs a year, he stated, pointing out that definite economic and efficiency factors are associated with purchase and utilization of power at this higher voltage level. In conclusion, Mr. Lawrence stated that interpretation of the NEC was the prerogative of inspectors, but they might bear in mind the possible use of highervoltage residential service when considering the application of such Code articles as 2001, 2113 and 2516.

Four more subjects, widely dissimilar in nature but all of definite interest to delegates at this meeting, were the topics of "Glass Electric Radiant Heating"; "Meter Sockets and the Development of (forthcoming) Standards"; "Fuses for Complete Electrical Protection", and "Principles Affecting Current-carrying Capacity of Insulated Wires and Cables".

The first of this quartet of subjects was covered by D. Knoll, vice-president and S. B. Aronson, sales manager, Berko Electric Mfg. Corp., who used sound-slides and numerous exhibits to review the development and advantages related



columbus contractor F. A. Davis takes active part in field problems symposium at recent Western Section, IAEI meeting in Chicago. He likes the forum type of meeting where everyone present has chance to express his views.



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FOUNDER OF Western Association of Electrical Inspectors (now Western Section, IAEI), 90-year old William S. Boyd of Chicago receives diamond IAEI lapel pin from international secretary C. L. Smith. Mr. Boyd was honored at 53rd annual meeting of the Western Section.

to electric heating, plus the construction, testing procedures and installation of typical units.

The second subject, presented by R. H. Fries, Associate Managing Engineer, Underwriters Laboratories, Inc., covered progressive development of meter housings, reasons for various locations, construction features, tests required to obtain UL approval, existing Code articles and interim amendments pertaining to this type of equipment.

Lee Edwards, Eastern Division Manager, Bussman Mfg. Co., St. Louis, Mo., spoke on the third topic; listing the objectives of fuses, time-current and short-circuit characteristics, capacity ranges and IC abilities of various types, design features and safety ratings, construction and new applications such as the individual fusing of lighting units connected to high-amperage industrial and commercial circuits.

Sam J. Rosch, Consulting Cable Engineer, Anaconda Wire and Cable Co., gave one of his usual interesting blackboard talks when he covered current-carrying capacities of insulated wires and cables. In this analysis he related theory with the findings of UL tests, proved the critical importance of heat-dissipating ability, exploded several general misconceptions in the industry and reviewed the mathematical formulae behind the values of Tables 1. 1A, 2 and 2A in the Code. Brief as his talk was, Mr. Rosch proved his points that Code values leave no margin for compromise, and that current-carrying capacities must be adjusted when number of cables in any fill is increased or when frequency of supply is altered upwards to 400 or 800 cycles.

Completing the technical part of the program, Eustace C. Soares, construction engineer, Industrial Engineering Service, New York, discussed purposes served by the neutral on a grounded system; F. P. D'Esopo, Chief Engineer and Manager, Product Engineering and Development, The Wiremold Co., Hartford, Conn., spoke comprehensively on the subject of surface metal raceway systems for commercial, industrial and residential wiring; while H. L. Schaefer, Chief Inspector, New York Board of Fire Underwriters, reviewed the history of his department and analyzed trends in the overall field of safety in construction, installation and control of electrical equipment.

At the closing session of this annual meeting, E. B. Fetty, Chief Electrical Engineer, Dept. License and Inspection, Washington, D. C., was unanimously elected to serve as president of the Eastern Section for the coming term. Elected to serve as vice presidents were Clifton R. Clark, Windsor, Conn.; George J. Bostley, Albany, N. Y.; John D. O'Connell, New York, N. Y., and Richard L. Lloyd, Washington, D. C. Retiring president John W. Hager of New York City was promptly returned to office by his election as the new secretary-treasurer.

Executive Committee members for the coming year include Anthony Angelo, Flushing, N. Y.; Charles A. Berlepsch, New Haven, Conn; Harold A. Brown, Rochester, N. Y.; Bart F. Green, New York,



J. J. McNELLIS of Indianapolis takes the floor at Western Section, IAEI meeting to report that homes with electrical heating in his area must have at least a 200-amp service raceway to permit future economical installation of heavier service entrance cables

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Fair weather or foul, the Sangamo Heavy Duty Time Switch operates accurately and dependably. That's because the case is specifically constructed and gasketed to withstand adverse atmospheric conditions. It's moisture-tight. It's dust-proof. It's the time switch you can depend on for every commercial and industrial application.







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CONTRACTOR EXPERIENCE with aluminum cable and conduit installation is recounted by J. Raymond Meehan, vice-president, Fischbach, Moore & Morrissey Inc., Chicago. Practical pointers were part of his contribution to a Western Section, IAEI symposium at Chicago.

N. Y.; Martin C. O'Rourke, Waterbury, Conn., and George H. Shardien, Elizabeth, N. J., all of whom served in the same capacity last year, plus newly-elected members Carlton E. Schaad, New York City; John W. King, Providence, R. I.; John W. Lewis, Washington, D. C., and John J. Harold, White Plains, N. Y.

Eastern Section representatives on the International Executive Council for the next year will include Peter J. Hicks, Jr., Providence, R. I.; Frank Stetka, Washington, D. C.; Elmer T. Quinn, Newark, N. J., and ex-officio John W. Hager, New York, N. Y.

This 33rd annual meeting was planned and engineered by large committees headed by James D. Lynett, general chairman; C. A. Berlepsch, treasurer; John W. King, secretary; J. D. O'Connell and H. A. Brown, members of the executive committee; W. H. Newton, Ch., Registration Comm.; C. A. Biddulph, Reception; C. A. Berlepsch, Dinner and Entertainment; G. W. Sundstrom, Publicity and Exhibits, and O. W. Single, Ch., Ladies Committee.

International officers present at the meeting included president H. S. Morr, Salt Lake City, Utah; secretary-treasurer Charles L. Smith, Chicago, Ill., and technical assistant secretary Everett F. Cogan, also of Chicago.



Housepower Is Theme Of N. J. Convention

The New Jersey Council of Electrical Leagues held their 21st annual convention at Atlantic City's Ritz-Carlton Hotel over the weekend of October 11-13, with 300 delegates representing an industrial cross-section of contractors and electricians, consultants and inspectors, wholesalers and utility personnel. Highlights of the program included an illustrated presentation of the \$1-million Monsanto allplastic House of the Future located at Disneyland; an analysis of "brainstorming" techniques practiced so extensively today to develop new ideas in industry and business; a practical demonstration of electronic cooking; election of officers for the coming year, plus an active social program.

Featured speakers included Don P. Caverly of Harvey Hubbell, Inc., who discussed many completelyrevolutionary lighting, appliance and control ideas that are now installed in the pace-setting Monsanto building; Frank C. Pesveyc, sales promotion manager of Public Service Electric and Gas Co., Newark, N. J., who used numerous amusing attention-holding slides to illustrate his brainstorming subject; and Douglas W. Quirk and Judy Rowen, product planning manager and home economics range specialist for the Hotpoint Co., who demonstrated now-available electronic cooking equipment while preparing a complete soup-to-nuts dinner (including cake, rolls and a crown rib roast) in a matter of minutes.

These various talks emphasized



electrical contractor Reg Richardson (third from right), newly-elected president of the N. J. Council of Electrical Leagues, receives congratulations from retiring president Cliff Justeson. Witnessing the ceremony are Jim Kennedy, 1st v.p. of the Council and General Chairman of the 21st Convention; Charles Beck, also a contractor, 2nd v.p.; Holt Murray, incoming secretary, and Jim Mahon, new treasurer.



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Spread a shield of comfortable warmth against cold walls, without drafts. Controlled by thermostat in each room. Matching baseboard fittings permit carrying out pleasing unbroken baseboard effect in any room.



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PANEL HEATERS

Wall Model BASEBOARD HEATERS

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INDUSTRIAL UNIT HEATERS

- SUSPENSION-TYPE (Illustrated) 34,150 to 153,675 BTU
- PORTABLE and SUSPENSION 5,122 to 25,613 BTU
- EXPLOSION-PROOF HEATERS Fully tested and approved for use in areas covered in Class 1, Group D. 6830 to 20,490 BTU
- FARM HEATERS Milk House, brooder pens, fruit and vegetable bins, etc. Pump House, valve pits, washrooms,



Suspension Type
Solves hard to heat areas in
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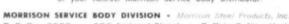
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Just the job for a Brook Motor, where continuous maintenance cost are important. In every industry . . . users have learned that "Brook is the motor you install and forget". All standard types . . 1 to 600 HP. Popular models warehoused world's most respected motor in major distributing centers. Dealers stations everywhere. Send for Catalog.

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SINCE 1904





JACK MASTERS, executive manager of the Essex Electrical League and unofficial manager of the New Jersey Council of Electrical Leagues for over 20 years, received a plaque at the Council's 21st annual convention "in appreciation of his devotion and distinguished service to the electrical industry.

the convention theme of "Let's Talk Housepower", stressing the necessity for providing adequate house wiring in order to supply capacity for new electrical conveniences and appliances of the future as well as the immediate present.

Another feature of the program was the presentation of a plaque of appreciation to W. J. (Jack) Masters, executive manager of the Essex Electrical League, who has served in that capacity for more than two decades.

Elected to serve as Council officers for the coming year were Reginald Richardson, Jersey Coast Electrical League, electrical contractor, president; James A. Kennedy, Essex Electrical League. Harvey Hubbell, Inc., 1st vice president; Charles Beck, Burlington Electrical League, electrical contractor, 2nd vice president; James Mahon, South Jersey Electric League, Public Service E & G Co., treasurer, and Holt Murray, Central Electric League, v. p. of Crescent Insulated Wire and Cable, secretary. The Council's executive committee will also include James H. Stapleton, Essex County, Public Service G & E Commercial Manager; George Nassor, Bergen County, wholesaler; and Cliff Justesen, Passaic County, wholesaler. the Council's immediate past presi-

General chairman for the convention was James Kennedy, Harvey Hubbell, Inc.



of steel.

CLI New Quarters A Laboratory of Light

The recent move of the Chicago Lighting Institute to its new quarters in the Marquette Building at 140 South Dearborn St. is more than a mere change of address. It is, in effect, a rehabilitation and expansion of facilities to provide "a laboratory of light" where businessmen, industrialists, architects, engineers, contractors and others can meet to resolve lighting problems and see and "feel" the effects of good visual environment. As in the past, the Institute will be a clearing house of lighting information with the added attraction of demonstration rooms capable of providing upwards of 500 footcandles of illumination. This was the general consensus of industry leaders attending the dedication open house.

Visitors touring the new quarters were conscious of the following dynamic teaching and demonstration "tools" skillfully blended into contemporary architectural surroundings:

An eye-catching foyer incorporating Plexiglas edge-lighting over an entire ceiling.

The latest in general office lighting over an area occupied by the Institute staff.

Private office lighting in the Institute Director's office demonstrating comfortably-controlled general lighting up to 500-footcandle intensity.

A consultation room where lighting problems can be discussed and solved with the aid of a combination of overhead lighting tech-



CHAIRMAN, Walter E. Stewart (St. Louis), of the Western Section IAEI National Electrical Code Committee reports to Section annual meeting at Chicago, his group has recommended five proposed revisions for the next Code.



LUMINAIRE MAINTENANCE IS AN EASY 5-MINUTE JOB FOR ONE MAN . . . WITH Servisafe POLES

Only "Servisafe" Poles give you the combination of speed, safety and savings in servicing pole-mounted lights. All work is accomplished at ground level. That's why one unskilled man can relamp and clean a light in an average of five minutes. He is safe from climbing and electrical hazards . . . needs no special equipment or assistance.

"Servisafe" Poles also permit greater luminaire mounting heights. This means fewer poles are required to illuminate a specific area . . . assures additional long-range savings.

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Non-sparking cast aluminum, strong and rustless. Available in a wide range of standard and special sizes. Lightweight, easily mounts onto equipment. Drilled and tapped to specifications. Made to Underwriters and Military Specifications.

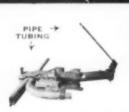
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SAVE 75% WITH TAL ALL-PURPOSE BENDER!





The Only One Shot Bender That Bends Without Changing Frames

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The Only Bender Available With or Without Remote Control and or Motor Pump

- Actual Savings 75% and more in direct costs of cutting, threading or welding, assembling, fitting and elbows.
- This MULTI-PURPOSE BENDER Will Handle All your requirements.
 Makes any bend or offset up to 180° In Only One Setting.
 Cold Without Filling. Any size up to 8".
- WITHOUT Experience anyone can make perfect, identical bends

 without guessing. Bend indicator and Bending Chart (Copyright 1956) furnished with each bender.

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DEPT. 21

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SYMBOLIC PINNING of past-president's badge on R. L. Thompson (right), Albuquerque, N. M., ushers him into the select group of Western Section, IAEI past presidents. John Denner of Saginaw, Mich., does the honors at recent Western Section meeting in Chicago.

niques, slides and other educational aids.

A lighting reference library containing texts, literature and domestic and foreign publications.

An industrial room for the demonstration of the ultimate in industrial lighting. Fixture arrangements include the three basic light sources: incandescent, mercuryvapor and fluorescent.

A school room where visitors can actually sit in classroom chairs and study the effects of good school lighting as different techniques are demonstrated.

A gallery of light—a 100-ft long area serving as a showcase of the latest in lighting fixtures.

The Light Center—a spectacular ellipitical shaped lecture hall complete with center and side stages and an intricate grid lighting arrangement over the seating area. This demonstrates direct and indirect, fluorescent incandescent general lighting with a blending of cove and color lighting. Here, the lecturer can vary lighting intensities up to 1,000 footcandles and effectively demonstrate the benefits of light-controlled visual environment to audiences sitting under this illumination.

Contributing to the flexibility of the Institute's demonstration facilities is the semi-permanent installation of the various lighting fixtures. Original design of the wiring and lighting system took into consideration the possibility of rearrangement, change, or replacement of units to keep pace with new or improved lighting techniques. Should managing-director Carl W. Zersen and his staff feel such a

change is necessary, the work can be done quickly and economically with minimum disruption to Institute activities.

The new quarters were designed by Shaw, Metz & Dolio, Chicago architects. Kelso-Burnett Electric Co. installed the wiring and lighting system.

The Chicago Lighting Institute is reputed to be the only lighting institute in the country operated by a group of individual companies -more than 40 members and associte members. Over the years CLI has been-and will be more so in the future-to the Midwest what NELA Park is to the nation from standpoint of good lighting promotion.

LBE Launches **Medallion Home Program**

Live Better Electrically Medallion Home program-designed to stimulate the construction and sales of new homes in all price ranges featuring full housepower. light for living and electrical appliances-was announced by Robert E. Ingmire, manager of Inter-Industry Activities for the Live Better Electrically program, at a special electrical industry meeting in New York.

The new home program, planned to serve as a national framework for locally-sponsored activities, is the first nationwide program ever to be sponsored by the electrical industry specifically to give prospective home buyers a recognizable hallmark attesting to a new home's electrical livability.

It will be spearheaded at the local level by some 300 utilities. who will establish electrical standards for Live Better Electrically Medallion Homes suited to local needs and preferences. These will be based on a minimum set of standards set up on a nationwide basis covering modern electrical kitchens, laundries, wiring for full housepower, and basic light for living.

"The utility companies exclusively will be empowered to award the medallions to qualifying home builders in their service areas," Mr. Ingmire said. "Special gold medallions also will be available for homes that excel electrically above and beyond basic utility requirements."

At the local level, the Medallion Home programs will be supported by a variety of trade allies including distributors, retailers, con-



POW-R-SPADE reduces man-hours to minutes!



A POW-R-SPADE user reports that one man and the POW-R-SPADE digs a trench in 40 minutes which under same conditions required 2 men 8 hours with hand spades. POW-R-SPADE is field tested and enthusiastically approved by hundreds of users.

POW-R-SPADE digs a neat 3 in. wide trench to any depth from 1 in. to 24 in. Operated by one man from start to finish. This machine digs right up to foundation of buildings. No complicated set-up required. No ugly scars or wheel marks to mar lawns.

Powered by well known gas engine. Safe and economical. Rugged construction. Oil sealed bearings, minimum maintenance. Shipped assembled, ready to go to work. Mail coupon for details.

Dirt is delivered finely pul-verized. Easy to backfill.

A PRODUCT OF

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Portable from -easily loaded

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Fast tool repairs for Rlack & Deckers tool owners



Genuine Black & Decker PARTS & SERVICE available near you

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PACKAGE PROPELLER FANS

- Rugged, Long-Lasting **Design Features**
 - Low Maintenance Cost
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 - Quiet, Efficient Ventilation



For low-cost ventilation and exhaust in commercial and industrial jobs, you can't beat "Buffalo" Propeller Fans. "Buffalo" offers a complete line to suit the broadest range of requirements . . . from a small room to a large plant: sizes 24" thru 120" deliver 5,000 to 250,000 cfm. Shipped completely assembled, ready to install and operate. Write for Bulletin FM-315 and prices.

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INDUSTRIAL EXHAUSTERS BELTED VENT SETS

PROPELLER FANS



tractors, realtors, mortgage bankers and local manufacturer contacts

Setting the pace for the local campaigns, the utilities will launch vigorous advertising campaigns directing traffic to Medallion Homes. Electric utilities and distributors will work with builders on new home features which will enable home owners to live better electric-

The utilities also will act as publicity headquarters, alerting the local press to developments in Medallion Home activities on a continuing basis.

In addition, they will feature special Live Better Electrically Medallion Home displays and exhibits in their show rooms and lobbies, and arrange for placement in banks, insurance companies, lending institutions, department stores, local fairs and shows.

At the national level, the Live Better Electrically Medallion Home program will be featured in six full-page national magazine ads in The Saturday Evening Post. American Home, Better Homes and Gardens: and in network television commercials beamed to some 40,-000,000 viewers of the CBS-TV show, "GE Theater."

New Electrical Contractor Organization Formed

Electrical contractors representing seven cities and three states met at Dallas, Texas on October 19 to form a new interstate association of electrical contractors.

Named the Associated Independent Electrical Contractors of America, the new organization is headed by Woody Norwood, Dallas, president; Paul Pitcock, Tulsa, vice president; Thos. E. D. Ferguson, Dallas, secretary and treasurer. The mail address is P. O. Box 4915, Dallas,

According to spokesman Dave Craton of Houston, "all progressive and ethical electrical contractors in the U. S." are eligible for membership. Objectives proposed include fostering a "code of ethics" for the industry, better service to the public, improved standards of engineering, materials and craftsmanship, cooperation with all groups working toward the betterment of the industry, personnel training and development, maintenance of good working conditions and fair wages and fair trade practices.

1958 Housepower Program

During 1958 the weight of the National Wiring Bureau's promotional facilities will be placed behind the job of helping electrical contractors, utility companies and home builders to translate consumer demand for Housepower into sales of wiring modernization jobs and adequately wired homes. To this end, the Bureau's program is built around the theme: HOUSE-POWER is SALES Power.

Nucleus of the Bureau's program for contractors will be a complete set of Housepower promotional tools. A new campaign manual entitled "Make '58 Your Biggest Wiring Year for Housepower," will describe the 1958 Housepower national advertising and show the electrical contractor exactly how he can follow through on the prospective wiring modernization jobs which the national campaign will develop.

In order to further aid electrical contractors located in outlying communities, who do not have access to direct promotional assistance from electric utility companies, the Bureau is making available an elementary promotion guide. This will include basic information on advertising and promotional techniques, directed to the electrical contractor who may not have had previous experience in promotional

activity. A slide presentation will be available which will detail the procedures to be followed when using the Housepower Rating Sheets and Estimate Proposal Forms. It is anticipated that these slides and the accompanying script will be used in connection with Housepower forum sessions.

Field service also will continue to be made available by the Bureau staff who will regularly visit key centers of Housepower and adequate wiring promotional activity, in order to lend personal assistance to electrical industry groups engaged in Housepower and certified adequate wiring campaigns.

In the new home wiring field, the Bureau will continue to encourage the establishment of local wiring certification Bureaus. It is anticipated that the number of local certification agencies licensed by the National Wiring Bureau will further increase during 1958. At present there are 125 such Burcaus, representing approximately 50% of all the residential meters in the United States.



"Mounting brackets on Clark-American flush-type Service Entrance equipment cut our installation time over 30%"



"Just position against a stud, drive two nails, and the box is mounted with front surface accurately placed to be flush with finished plaster."

This is one of the many reasons why Clark-American service entrance equipment is the choice of progressive electrical wiring contractors like Thomas A. Haines, owner of the London Road Electric Company, Cleveland, Ohio.

Taking advantage of this feature, and the ample wiring space, many conveniently located and easily removed knockouts in every Clark-American panel, Mr. Haines has been able to cut his installation time substantially on house wiring jobs.

Dependable, trouble and service free Clark-American utility service equipment can be selected from models and sizes to meet any commercial or domestic electric load requirement. Trim, compact units for service up to 200 amperes are available with adequate outs to meet the requirements of the modern all-electric home.

FEATURES INCLUDE:

- Baked-on grey enamel finish
- · One-piece trim and door
- Cover easily removed
- Plenty of knockouts, conveniently located
- Knockouts easily removed
- Generous wiring space
- Slotted upper mounting holes
- Plated solderless connectors suitable for copper or aluminum wire
- Wire-binding screws on plug fuse terminals
- Non-interchangeable pullouts
- Wiring diagram inside door

Write for your free copy of the CLARK-AMERICAN "Product Selector"-32-page book with complete catalog plug fuse circuits and cartridge pull- plus application and installation data. CLARK CONTROLLER

What is a FAIR

PRICE?

To be **FAIR**, both your customer and you must profit.



NATIONAL PRICE SERVICE

suggests fair resale prices for electrical materials and tells you what they cost from day to day.

Keep current.

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IAEL Conference Held

The 22nd Annual Conference of the International Association of Electrical Leagues was held at the Sinton Hotel, Cincinnati, Ohio, October 2-4.

At the business session, officers were elected for the coming 12-month period as follows: President—Glen L. Logan, Los Angeles; Vice President—John S. McDermott, Kansas City; Treasurer—C. C. Simpson, Chicago; and Secretary—Herbert E. Cook, Detroit. The immediate past president, Don E. Rosenthal of St. Louis will serve as Advisory Member of the Board of Governors. John Biggi, Manager of the Business Development Department of NEMA was reappointed Corresponding Secretary.

The general sessions, which began on Wednesday, October 2, featured a series of forecasts of developments to be expected in the appliance field in coming years. These were presented by leading men in the electrical manufacturing field.

"Opportunities for Industry Promotion of Residence Heating" was the topic presented by Mr. E. A. Snyder, Manager, Sales Division, American Gas & Electric Company. In citing the experience of the American Gas & Electric system, Mr. Snyder indicated a vast potential market for electrical contractors, dealers and distributors in the field of residential heating installations for replacement purposes in existing dwellings, as well as in new homes.

Industry promotion of electrical wiring came in for major attention. E. P. Werley, Chairman of NWB's Commercial Task Group, and Director of Market Development for Pennsylvania Power & Light Company told of the reception accorded this program in 1957 and plans for 1958 for the new all-industry promotion in commercial wiring.

P. C. Goodenough, Utility Coordinator of Better Homes and Gardens, presented an analysis of the electrical contractors' sales activities as indicated by entries in the electrical contractors' contest, sponsored by that magazine, and recently concluded.

The Annual Award of a plaque for the outstanding activity of an electrical league in promoting electrical housewares during the past 12 months was presented at the Annual Banquet on Thursday evening to John A. Morrison, in recognition of the program sponsored by the Electrical Association of Philadelphia.

Latrobe Electrical Products

TOPS IN DESIGN

"Latrobe" Floor Boxes and Wiring Specialties are designed to do their job easily and surely with no excess parts. This same compactness of design makes for fast, easy installation.

> Adjustable Floor Box

Designed for telephone outlet or where permanent connections are made, or as a junction box.



Non-Adjustable Watertight Floor Box



Unique, practical design cuts installation time; makes safer job and leaves more wire space inside box. Cover Plate is 3½" diameter.

PIPE OR CONDUIT



This new malleable iron clamp with a double safety bite of case hardened tool steel is cadmium plated to prevent rust.

Two models—Right Angle and Parallel support. Each in 10 sizes to handle pipe or conduit 1/2" thru 4".

Latrobe Products

Non-Adjustable Floor Boxes Adjustable Floor Boxes Gang Boxes . . . Cover Plates Junction Boxes . . Noxzles Pipe or Conduit Hangers Insulator Supports Cable Supports . . Fish Wire Staple and Cable Clips

Write for new catalog
Sales Representatives in all principal cities





PUBLIC RELATIONS conscious electrical inspectors hold three-man forum at Chicago inspector meeting. Reviewing local programs are (L to R) Irwin Weaver, Dayton, Ohio; J. E. Fisher, Elkhart, Ind.; and A. H. Welklin, Ft. Wayne, Ind. Mr. Welklin is chairman of the Western Section, IAEI public relations committee.

NISA News

The first regular meeting of NISA's newest chapter, the Western Michigan Chapter, was held in Grand Rapids on October 21 with more than 100 members of Great Lakes Chapter as guests.

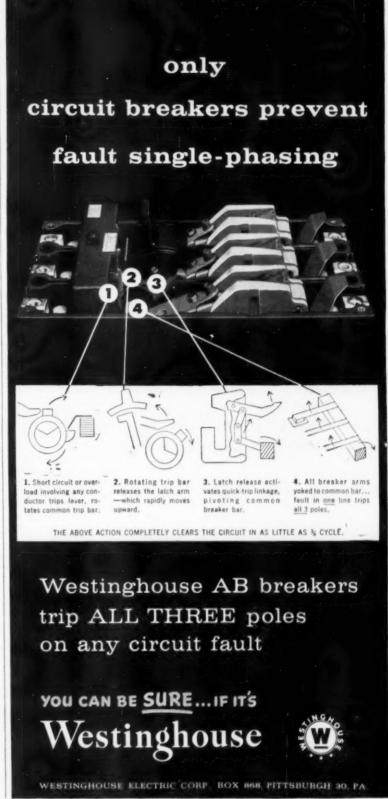
The newly-chartered group, NISA's 34th, takes in electric motor service shops in the upper peninsula and the western half of Michigan. The eastern part of the state belongs to Great Lakes Chapter.

NISA president Alfred Elson Jr. was one of the national officials at the meeting. Executive vice-president Joseph M. Harrington, director Joseph Dudley and NISA News editor Horace Barks also attended.

A number of national officers and directors of NISA were also on hand in Miami later in the week for the Southeastern Chapter Conference. The meeting, which included two full days of talks and sessions, opened with a reception Thursday night, October 24, and concluded with a dinner Saturday night, October 26. The meeting was held at the Fontainbleu.

Dr. G. A. Cypher of General Electric discussed insulation research. Oscar Clot of Peninsular Armature Works, Miami, demonstrated dynamic balancing techniques, Dr. T. J. Bulat of Ultrasonic Application & Research Laboratories, Davenport, Iowa, spoke on cleaning methods. A fourth speaker was Richard Wareham, president, Special Electric Co., distributors of water-reducible varnish.

Thirty of the more than 400 members and guests attending the meeting journeyed to Havana on a post-conference tour.





Combination EXHAUST FAN LIGHT and HEATER

World's first, safest, most convenient, most practical bathroom unit! All purpose fan-light-heater combination providing immediate warmth from combination 1450 watt repid heating coil and Mirro-lux Alzak reflector. Super-quiet, trouble-free exhaust blower whisks steamy vapor and odors away, and clean, dust-free 120-watt recessed light floods bathroom with abundant, non-glaring, pleasantly diffused light.

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Please send complete information of Pryne Combination Exhaust Fan, Lig	on the new tht and Heater!
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S. J. STEWART, president of the New Orleans Chapter and general chairman of the 25th NISA Convention — the "Jubilee Celebration" in his city May 11-15—with NISA's executive vice-president Joseph Harrington. Mr. Stewart is owner of S. J. Stewart (Electric), New Orleans.

NISA directors attending were J. Arthur Turner Jr. of Tampa (Fla.) Armature Works; Alex A. Shovan of Industrial Electric Service Co., Hawthorne, N. J.; Frank W. Ross of Ross Electric Motor Shop, Fairmont, Minn.: John W. Overton, of Electric Motor & Repair Co., Richmond, Va.; Charles J. Covington of Dowzer Electric Machinery Works, Mount Vernon, Ill.; H. C. Blenkhorn of Blenkhorn & Sawle, Ltd., St. Catherines, Ont.; and national president Alfred Elson Jr. of New England Machine & Electric Co., Pawtucket, R. I.

The Association's board of directors holds its mid-year meeting in Milwaukee on November 14-16.

C. S. (Pat) Moran of Standard Electric Motors, Detroit, is chairman of the "buyers' guide" committee of Great Lakes Chapter. William M. Saunders of Lenawee Electric, Adrian, Mich. is chairman of the group's scholarship committee.

Other committee chairmen include: Charles Howard, finance; Bill Henry, membership; Ralph Arbor, program; Ed Burke, bylaws; Stan Graywall, attendance; Red Watterson, friendship; and Stan Polk, nominating.

A detailed survey of the products and services of members of the New England Chapter is being conducted by Fred Ferris of Northeastern Electric, Boston. "This will help us to become better able to serve our customers," Ferris explained,

Weston B. White of Consolidated Electric Co. addressed the New York Metropolitan Chapter on September 19 at the group's dinner meeting at Hotel Martinique's East



The newest, greatest wall switch for fast, easy installation...quiet as a mouse!

No screws, no posts, no special tools or "knack" needed.

One or two #12 or #14 wires slip into bulldog grip clamps through specially designed holes in switch case. Cuts installation time more than 50%! Patented, instantaneous side release.

WRITE FOR THE SLATER CATALOG. IT LISTS HUNDREDS OF TIME AND TROUBLE-SAVING WIRING DEVICES TO MAKE YOUR JOB EASIER ... MORE PROFITABLE.



Room. His subject was his company's new nuclear power plant.

One of the largest groups to attend a meeting of the New England Chapter met on September 12 at Hotel Bradford in Boston. Fifty-four attended to hear Ray Chambers and George Mabey of Acme Electric Co., Cuba, N. Y. discuss their firm's line. Another Acme representative, Joe Hupp, discussed technical details of transformer theory and application.

Greater St. Louis Chapter of NISA held its fall outing and business meeting at St. Clair Country Club in East St. Louis, Ill. and at the Illinois Electric Works in the same city. Golf and cards preceded dinner. After dinner the group toured the shop which is owned by Joseph Cavataio.

Mid-South Chapter met in Natchez, Miss. on September 14. Its December meeting is scheduled for Chattanooga. The March meeting will be held in Little Rock.

North Central Chapter met in Brainerd, Minn. on September 13-14. Among the guests were national president Alfred Elson Jr. and Mrs. Elson. The group toured a local paper mill and heard talks by representatives of several suppliers.



CHAIRMAN of the women's program of the 25th NISA Convention in New Orleans May 11-15, is Mrs. Margaret Stewart Johnson, (standing), She is office manager of the S. J. Stewart (Electric) of New Orleans and is shown with employe Elizabeth King. Mrs Johnson is the daughter of S. J. Stewart, president of the New Orleans Chapter and general chairman of the convention.



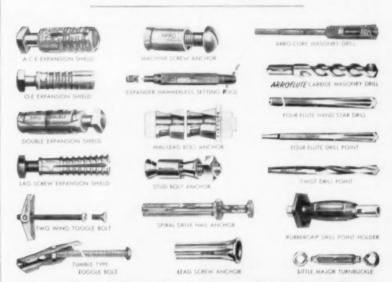
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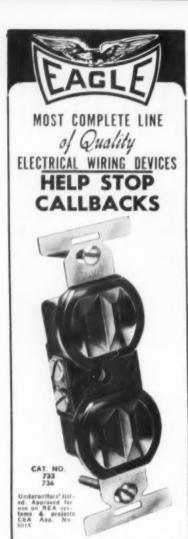
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Chapter member Warren Mielke and Jim Anderson also spoke.

. . . . West Virginia Chapter met October 9 at the West Virginian Hotel in Bluefield. Host member was Coppinger Machinery Service Co.

Los Angeles Chapter met on Oct. 8 at Michael's Restaurant. . . .

The Association's first meeting in Durango, Colo., was held on September 20-21 when the new Rocky Mountain Chapter held its first regular meeting since it was organized in Denver early this year. Attending were national vice-president Paul Sievert of Sievert Electric Co., Chicago: staff engineer C. H. Lankford; and national director Thomas Paul of Paul Electric Co., Sioux City, Iowa. . .

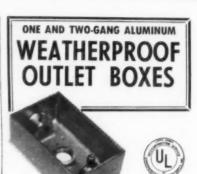
Another big fall meeting was the one in Beaumont, Tex. September 19-21 held by the Southwestern Chapter. More than 125 attended. Speakers included Dr. R. W. Setzer, dean of the school of business of the local Lamar College; Ray Welborn of J&J Armature Works; M. H. Dougharty of the Beaumont First National Bank; and Harold Mc-Intosh of McIntosh Marine Service Co., all of Beaumont.

Other speakers were Herschel Wooley of Houston (Tex.) Armature Works; national president Alfred Elson Jr. and Joseph M. Harrington, NISA executive vicepresident.

Allan M. Grayson of W. M. Smith Electric, Dallas, has been named to the NISA editorial board and the association's publicity and publication committee by chairman John W. Overton.



C. A. HENDERSON, secretary-treasurer, Oklahoma Chapter, IAEI, gives Western Section convention delegates in Chicago a slide tour through the electrical facilities at an Oklahoma air force base.



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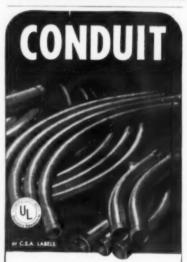
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DATES AHEAD

National Electrical Manufacturers Assn. — Annual convention, Tray-more Hotel, Atlantic City, N. J., November 11-15.

National Electrical Contractors Association-Convention and Exposition, Music Hall, Cincinnati, Ohio, November 11-16.

American Standards Assn. National Conference on Standards, Francis Hotel. San Francisco. Calif., November 13-15.

Air-Conditioning and Refrigeration Industry — 10th Exposition, International Amphitheatre, Chicago, Ill., November 18-21.

American Institute of Electrical Engineers-Winter general meeting, New York, N. Y., January 20-24, 1958.

Industrial Heating Equipment Assn., Inc. - Penn-Sheraton Hotel, Pittsburgh, Pa., January 27-28.

American Society of Heating & Air Conditioning Engineers — Annual meeting, Penn-Sheraton Hotel, Pittsburgh, Pa., January 27-29.

Plant Maintenance & Engineering Show — International Amphitheatre, Chicago, Ill., January 27-30.

Southeastern Electrical Wholesalers Assn .- Annual convention, Biltmore Hotel, Atlanta, Ga., January 29-31.

Upper Midwest Electrical Convention & Trade Exposition — Leamington Hotel and Municipal Auditorium, Minneapolis, Minn., February 2-5.

Power & Communications Contractors Assn. -- 13th annual convention, Roosevelt Hotel, New Orleans, La., February 2-5.

National Industrial Electric Heating Conference — Netherland Hilton Hotel, Cincinnati, Ohio, February

National Rural Electric Cooperative - Annual meeting, Dallas, Assn. Texas, February 2-6.

National Electrical Week-An all-industry event, February 9-15.

National Adequate Wiring Conference -Hotel Statler, Detroit, Mich., February 20-21.

First National Lighting Exposition-Coliseum, New York City, March

Electrical Contractors Assn. of On-tario—London Hotel, London, On-tario, Canada, March 20-22.

Electrical Industry Show and Electrical Maintenance Conference — Shrine Exposition Hall, Los Angeles, Calif., March 27-29,

Illuminating Engineering Society Northeastern Conference, Statler Hotel, Hartford, Conn., April 10-11; East Central Conference, John Mar-shall Hotel, Richmond, Va., April 14-15: South Central-Southeastern Conference, Lafayette Hotel, Little Rock, Ark., April 24-25; Southwestern Conference, Washington Youree Hotel, Shreveport, La., April 28-29; Midwestern Conference, Hotel President, Kansas City, Mo., May 1-2; Inter-Mountain Conference, Whitman Hotel, Pueblo, Colo., May 8-9; South Pacific Conference, El Cortez Hotel, San Diego, Calif., May 12-13; Pacific Northwest Conference, Multnomah Hotel, Portland, Ore., May 22-24; and Great Lakes Conference, Sheraton Hotel, Rochester, N Y., June 23-24.

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Rocky Mountain Electrical League Annual convention, Shirley Hotel, Denver, Colo., April 13-20,

National Industrial Assn. - 25th "Jubilee Celebration," Hotel Roosevelt, New Orleans, La., May 11-14.

National Fire Protection Assn. - Annual meeting, Palmer House, Chicago, III., May 19-23.

National Association of Electrical Distributors—50th annual convention, Civic Auditorium, San Francisco, Calif., June 9-13.

Edison Electric Institute - Annual convention, Convention Hall, Boston, Mass., June 9-12.

New York State Assn. of Electrical Contractors & Dealers, Inc. - Annual convention, Whiteface Inn, Lake Placid, N. Y., June 29-July 4.

Illuminating Engineering Society --National Technical Conference, Tooronto, Canada, August 17-22.

International Association of Electrical Inspectors Western Section, Sher-aton-Cadillac Hotel, Detroit, Mich., September 8-10; Northwestern Section, Billings, Mont., Sept. 15-17; Southwestern Section, Southern California, September 22-24; Canadian Section, Montreal, Quebec, Canada, October 10-11; Eastern Section, October 13-15; Southern Section, Miami, Fla., October 20-22

International Association of Electrical Leagues-Annual Conference, Washington, D. C., October 1-3.

Canadian Electrical Manufacturers Assn. Annual convention, Sheraton-Brock Hotel, Niagara Falis, Canada, October 8-10.

National Electrical Manufacturers Assn. — Annual conference, Hotel Traymore, Atlantic City, N. J., November 10-14.

National Electronics Conference, Inc. Hotel Sherman, Chicago, Ill., Octoher 13-15.

National Electrical Contractors Assn. -Annual convention and National Electrical Exposition, Adolphus Hotel, Dallas, Texas, November



POST-SESSION HUDDLE at recent Western Section, IAEI meeting in Chicago finds electrical inspectors (L to R) Harry Burbridge of Kalamazoo, Mich.; and Ray Rider of Dearborn, Mich., discussing uniform municipal codes and licensing Mr. Rider is chairman of the Michigan State Electrical Administrative Board.

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Headquarters Announcements

Robertshaw-Fulton Controls Co.. Instrument Div., is new name of the Fielden Instrument Division. Philadelphia, Pa.

Circle F Mfg. Co., Trenton, N. J. Anthony Timar, division sales manager, jobber sales; William R, Harris, division sales manager, O. E. M. sales; Arthur E. Claus, general sales manager.

Thomas Industries Inc., Louisville, Ky .- T. R. Fuller, general sales manager.

Kaiser Aluminum & Chemical Corp., Chicago, Ill.-Clarence W. Higbee, assistant general manager; Gillette N. Houck, sales manager, both with newly established Electrical Conductor Div.

Harvey Hubbell, Inc., Bridgeport, Conn.-Don P. Caverly, director of engineering and develop-

General Electric Co., Schenectady, N. Y.-Robert Paxton, member of the board and executive vice president-operations; Arthur F. Vinson, vice president and group executive-Apparatus Group; Halbert B. Miller, vice presidentmanufacturing services; James H. Goss, vice president and group executive - Consumer Products Group.

Benjamin Electric Mfg. Co., Des Plaines, Ill.-John R. Bartizal, president, in addition to present position as chairman of the board; J. H. Fall, III, vice president and treasurer; George A. Hamm, vice president, in addition to present duties as secretary: Arthur E. Swedenborg, vice president in charge of sales.

Westinghouse Electric Corp., Lamp Division, Bloomfield, N. J. William J. Knochel, director of electroluminescent lamp engineering, new Rayescent lighting organization.

Square D Co., Detroit, Mich .-Lawrence G. Maechtlen, first vice president.

Thomas A. Edison Industries, Instrument Div., West Orange, N. J.-John J. Brennan, manager, West Orange Plant No. 1.

Fairbanks, Morse & Co., Chicago, Ill .- W. F. Wahlenmaier, manager, New Orleans branch; Milo C. Roy, manager, Portland branch; W. B. Morse, manager. Chicago branch.

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IT'S LIKE THIS, J. G. Benton, Quebec Board of Electrical Examiners, Montreal, Canada, gestures as he makes a point to N. A. Cockburn, Canadian Standards Association, Toronto, Both were at recent Western Section, IAEI meeting in Chicago.

General Electric Co., Syracuse, N. Y .- Harold G. Towlson, manager of engineering, Technical Products Dept.

Crouse-Hinds Co., Syracuse, N. Y .- Albert H. Clarke, vice president for manufacturing; Russell P. Northup, vice president for en-

General Electric Co., Schenectady, N. Y .- New component managers in Outdoor Lighting Dept., Hendersonville, N. C.: R. J. Swackhamer, user industrial sales; E. G. Wendling, component and intermediate distribution sales; C. K. Fulton, propositions, quotations and bids; W. E. Schwanhausser, application engineering; J. C. Boyter, advertising and sales promotion; S. H. Walker, marketing administration and personnel development; K. D. Tobin, acting manager, product planning, service and marketing research.

Spang-Howarduct Div., National Supply Co., Melrose Park, Ill .-Edward A. Scanlon, sales manager.

General Electric Co., Circuit Protective Devices Dept., Plain-ville, Conn.—Charles P. Hayes, William W. general manager; Smith, manager, distributor sales; Paul E. Eldridge, manager; original equipment manufacturers sales.

Federal Pacific Electric Co., Newark, N. J .- James A. Kerr, director of advertising and public relations

Thor Power Tool Co., Chicago, III .- A. V. Moroz, electric tool sales manager; Irving M. Converse, comptroller.

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Standard Transformer Co.: Bradley Co., Philadelphia, representative in Eastern Pennsylvania, lower New Jersey and Delaware.

Kaiser Aluminum & Chemical Corp., Electrical Conductor Div.: J. W. Loveland, New York, regional manager of Northeastern District; W. J. Lawrence, Philadelphia, regional manager of Southeastern District.

Curtis Lighting, Inc.: Fred A. Stewart, regional sales manager, Eastern region, office in N. Y.

SOUTH ATLANTIC

Lake Shore Electric Corp.: Herbert J. Baer Co., Richmond, Va., representative in Virginia; C. B. Rogers Co., Clearwater, representative in Florida; C. B. Rogers & Associates, Atlanta, representative in Georgia and South Carolina.

Ruby-Philite Corp.: W. C. Evans and Associates, representative in Florida, office in Fort Lauderdale.

Allis-Chalmers Industries Group: C. C. Jordan, Southeast regional representative for power plant equipment.

EAST CENTRAL

Kaiser Aluminum & Chemical Corp., Electrical Conductor Div.: H. B. Stauffer, Cleveland, regional manager in Great Lakes area.

Bryant Electric Co.: Clyde W. Foster, midwest regional manager.

American Steel & Wire Div., United States Steel Corp.: Norman M. Sted, manager of sales, Central Area.

Allis-Chalmers Industries Group: Robert B. Fulton, manager of new district office in Dayton, Ohio.

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Curtis Lighting, Inc.: Frank J. Bernd, regional sales manager in Chicago region.

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Allis-Chalmers Mfg. Co.: Cabell Electric Co., Jackson, Miss., agency for feeder voltage regulators and power transformers in Mississippi.

Gould-National Batteries, Inc., Industrial Div.: Richard Relf. Detroit regional sales manager.

Clark Controller Co.: Sidney W. Nelson, sales representative, Cincinnati District Office.

Ruby-Philite Corp.: E. C. Baumann Co., Chicago, sales representative in Chicago area.

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Lake Shore Electric Corp.: Hurbert Kaub, representative in Montana, Wyoming, Colorado, and New Mexico; Davis Sales Co., representative in Wisconsin, Minnesota, Iowa, North and South Dakota.

Blackhawk Mfg. Co.: James R. McCreight, Milwaukee, territory manager for Kansas, Nebraska,

southwest Iowa, and western Mo. Fisher-Pierce Co.: L. R. Ward Co., offices in Dallas and Houston, representatives in Oklahoma and Texas.

WEST

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Leadlight Fixture Co.: George E. Mitchell, Jr., sales engineer in San Francisco Bay area, office in Oakland.

Kaiser Aluminum & Chemical Corp., Electrical Conductor Div.: L. M. Guibara, Los Angeles, regional manager of Western region.

Curtis Lighting Inc.: Earl I. Dinsmore, regional sales manager, Southwestern region.



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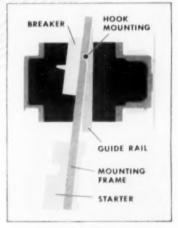
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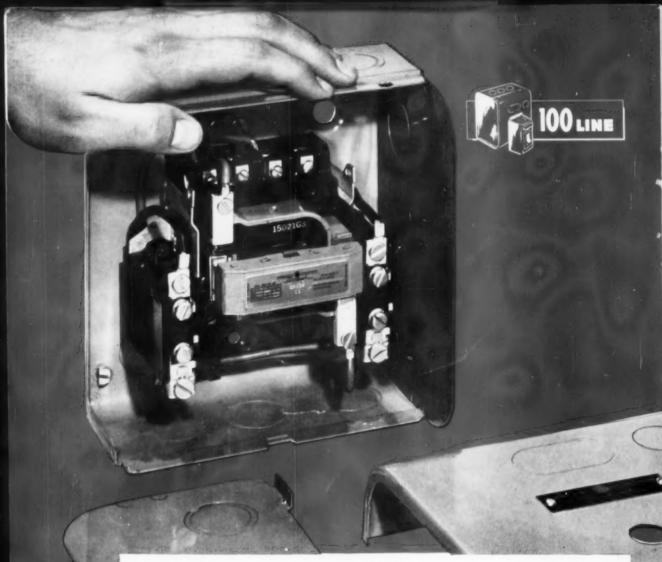


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